SCIENCE

VOL. 94 FRIDAY, AUGUST 8, 1941 No. 2432

The American Association for the Advancement of Science:

The Pasadena Meeting of the Pacific Division: PROFESSOR J. MURRAY LUCK 121

Obituary:

Erhard Fernholz: DR. GEORGE A. HARROP and DR. HOMER E. STAVELY. *Recent Deaths* 130

Scientific Events:

The Royal College of Surgeons; Expeditions of the American Museum of Natural History; Award to the Bausch and Lomb Optical Company; Defense Training Courses of College Grade; Research in Industry 131

Scientific Notes and News 134

Discussion:

Illusions in Printed Matter: DR. C. E. WATERS. *Designation of Locations on Maps:* ROBERT H. MERRILL. *International Cooperation:* PROFESSOR MARSHALL H. STONE 136

Scientific Books:

Vitamins: PROFESSOR S. B. WOLBACH. *Cells:* PROFESSOR D. F. POULSON 138

Reports:

Award of Guggenheim Fellowships for 1941 139

Special Articles:

The Origin of the Rete Apparatus in the Opossum: DR. R. K. BURNS, JR. *Arginase:* DR. RENATE JUNOWICZ-KOCHOLATY and WALTER KOCHOLATY. *The Induction of Fertility in Genetically Self-sterile Plants:* DR. WILLIAM H. EYSTER 142

Scientific Apparatus and Laboratory Methods:

A New Procedure for Adsorption Analysis: PROFESSOR ARNE TISELIUS 145

Science News 8

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE PASADENA MEETING OF THE PACIFIC DIVISION

Edited by Professor J. MURRAY LUCK

SECRETARY

DURING the week of June 16, 1941, the twenty-fifth annual meeting of the Pacific Division, American Association for the Advancement of Science, and of eighteen associated societies was held at Pasadena, California. The meetings extended over six days.

In two respects at least they are to be regarded as the most eventful in the history of the division. The attendance far exceeded that of any previous meeting, the total number of members and guests who registered being 1,314. There is good reason for believing that many were in attendance at the meetings who failed to register. At the previous meeting in Pasadena (1931) which was national in character, the total registration for the week was 1,193. It is a matter of interest and at the same time a matter of regret to scientists on the Pacific Coast that these meetings failed to enjoy the attendance and participation of any appreciable number from the East. For example, 1,142 of those who attended the present meeting were from California, and only 82 were from outside the territory of the Pacific Division proper. The meeting was also eventful in that it represents a turning point in the history of the division—the completion of the first quarter-century of organized activity on the part of scientific societies in the Pacific states.

It was inevitable that the complexion of the meetings should be colored somewhat by the troubled con-

ditions existing abroad and the grave emergency that confronts the nation. That the conditions of the day are such as to throw upon organized science an added burden of responsibility is reflected in various contributions to the meetings proper. Most noteworthy in this respect was the divisional symposium on "Science and National Defense," in which papers were contributed by Professor M. P. O'Brien, of the University of California, Dr. Karl F. Meyer, of the Hooper Foundation for Medical Research, and Dr. Arthur G. Coons, of Claremont Colleges. The topics were "The Relation of the Engineering Colleges to the National Defense Program," "Medical and Public Health Problems in Relation to National Defense" and "The Economics of National Defense," respectively.

The afternoon of the same day was devoted to surveys of current research, a program which has been repeated annually by the Pacific Division for many years. Dr. W. S. Adams, Mount Wilson Observatory, reviewed some of the "New Results in Stellar Spectroscopy"; Professor E. W. Schultz, of Stanford University, discussed some of the outstanding "Recent Advances in the Study of Poliomyelitis"; Julian Hinds, of the Metropolitan Water District of Southern California, gave an interesting survey of some of the engineering problems encountered in the construction of the Metropolitan Aqueduct; and Dr. Myron Prinzmetal, of the University of Southern California, presented a résumé of "Recent Studies on High Blood Pressure."

The evenings of Tuesday, Wednesday and Thursday were devoted to addresses of general interest to visiting members, as well as to the lay public. That of Tuesday evening was delivered by Professor H. U. Sverdrup, president of the Pacific Division, who spoke on "The Pacific Ocean." On Wednesday evening Professor Max Mason, of the California Institute of Technology, discussed the progress of work on the 200-inch telescope, an instrument which is an increasing source of interest to visitors at the institute. The concluding address was given by Dr. John H. Lawrence, of the University of California, on "Biological Studies with Radioactive Elements."

Several events of a social character, arranged for the entertainment of visiting members and guests, completed the general sessions of the division. Deserving of special mention was the reception tendered by the Huntington Library and Art Gallery on the afternoon of June 16. A special exhibit of Aeronautica, historical in character, and arranged by the staff of the Huntington Library, proved to be of outstanding interest. In addition to more than 1,500 printed items, the library's Aeronautica collection is rich in engravings, drawings, cartoons and other pictorial items.

On Wednesday afternoon tea was served in the patio of the Athenaeum to approximately 300 of the members in attendance, while on Thursday afternoon many took advantage of an opportunity to visit some of the beautiful private gardens in Pasadena.

Meetings of the executive committee of the council were held in the course of the week. Professor D. R. Hoagland, of the Division of Plant Nutrition, University of California, was elected to the presidency of the division for the ensuing year, and A. R. Moore, of Oregon State College, Corvallis, was elected a member of the executive committee in succession to Paul W. Merrill, who retires on completion of his term of office. T. I. Storer and Linus Pauling were elected to the council as members-at-large, for four-year terms.

Announcement was made that the meetings of 1942 and 1943 will be held in Salt Lake City, Utah, and Corvallis, Oregon, respectively.

Local arrangements for the meeting were in the care of a committee consisting of Paul W. Merrill, *chairman;* William R. Smythe, *vice-chairman;* Alice Beach, *secretary;* Ian Campbell; Philip S. Fogg; William V. Houston; F. W. Maxstadt; William W. Michael; Robert A. Millikan; Robert O. Schad; Franklin Thomas; J. Paul Youtz.

Publicity and press relations were under the immediate supervision of Professor William Huse, of the California Institute of Technology.

Three institutions, assisted by the Pasadena Chamber of Commerce, served jointly as hosts for the meeting: The California Institute of Technology, the Henry E. Huntington Library and Art Gallery and the Mount Wilson Observatory.

Perhaps there is no satisfactory way of measuring the "success" of scientific meetings, but it is perhaps fair to say that, in the judgment of many, the meetings were outstanding. Quite apart from the unusually heavy registration, the sessions of individual societies were exceptionally well attended and many papers of outstanding merit were presented. Some of the symposia organized by individual societies were of singular merit and evoked wide-spread interest and participation on the part of the members.

All the meetings were held on the campus of the California Institute of Technology, which provided excellent facilities for the participating societies. Numerous exhibits arranged by departments of the institute proved to be of great interest to visiting members and guests.

It is hardly possible within the limits of available space to describe adequately excursions to points of interest in the immediate vicinity, but mention should be made of the Hale Solar Laboratory of the Mount Wilson Observatory, which was open daily, and of the special trip to Mount Wilson arranged for visitors on Friday afternoon.

SESSIONS OF AFFILIATED SOCIETIES

Eighteen of the affiliated and associated societies participated in the meetings and over five hundred papers were presented. The reports of the various sessions follow:

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS PACIFIC SLOPE BRANCH

(Report by Roy E. Campbell)

The 26th annual meeting of the Pacific Slope Branch was highly successful. Of the total of 57 papers listed on the program, only 3 authors were absent. The total attendance was 335. Each session was started with an invitational paper of special interest, among which were: "Commodity Treatment for the Alleviation of Plant Quarantine," by D. B. Mackie; "Some Problems of Western Forest Entomology," by K. A. Salman; and "Radioactive Elements in Entomological Research," by R. Craig.

Wednesday sessions were devoted to reports of experimental work on vegetable, sugar-beet and garden insects, parasites and fumigation. There was a session on Wednesday night on "Systematic Entomology" arranged by E. O. Essig, in which this subject was thoroughly discussed by Professor Essig, H. H. Keifer, E. G. Linsley, M. T. James, G. F. Ferris and R. L. Usinger. The interest in this subject was shown by the fact that there were 145 in attendance.

The outstanding session was on Thursday, devoted to a symposium on "Petroleum Oil Sprays on Deciduous and Citrus Fruit Trees." All papers and discussions were by invitation. W. M. Hoskins discussed "Some Recent Advances in the Chemistry and Physics of Spray Oils and Emulsions," and A. W. Cressman presented "Methods of Determining Oil Deposit." E. L. Overholser discussed "Physiological and Physical Effects of Spray Oil on Deciduous Trees." "Effects of Petroleum Oil Sprays on Citrus Trees" was given by P. W. Rohrbaugh, and "Effects on Quality of Citrus Fruits" by W. B. Sinclair. The use of toxicants in oils was discussed by several speakers.

On Thursday night a very successful dinner was given at the Altadena Country Club, with an attendance of 278.

The Friday morning program, devoted to "Problems in Western Forest Entomology," was ably arranged by K. A. Salman, and several interesting papers were given by members of the staff of the Forest Insect Laboratory at Berkeley on various western forest insects. On Friday afternoon the sessions were concluded with miscellaneous papers, including some on the honeybee, thrips, properties of insecticidal dust and a colored motion picture called "Louse Control."

The officers elected for the ensuing year were: *Chairman,* George F. Knowlton, Logan, Utah; *Vice-Chairman,* Jas. C. Evenden, Coeur d'Alene, Idaho; *Secretary-Treasurer,* Roy E. Campbell, Alhambra, California.

AMERICAN ASSOCIATION OF PHYSICS TEACHERS

(Report by E. C. Watson)

The program of the American Association of Physics Teachers consisted of a session devoted to contributed papers and a session devoted to invited papers. Speakers ranged from Tucson, Arizona, to Seattle, Washington, but were mostly from Southern California. The attendance totaled more than 80 and fell at no time below 50. Twelve states in all were represented.

Twelve papers only were presented and so ample time was available both for adequate presentation and for discussion. Three of the papers dealt specifically with problems in the teaching of physics, three with the history and philosophy of physics, and two were accompanied by experiments or demonstrations. Discussion centered principally around Professor V. F. Lenzen's paper on "The Meaning of Dimensions" and Professor R. W. Kenworthy's paper on "Concepts of Potential Difference and Electromotive Force as Presented in College Physics Texts." Unfortunately, Professor T. von Karman was called to Washington on national defense work and so was unable to present his paper on "Aerodynamics in College Physics."

AMERICAN CHEMICAL SOCIETY, PACIFIC INTERSECTIONAL DIVISION

(Report by Carl Niemann)

The meetings of the Pacific Intersectional Division of the American Chemical Society were well attended and sixty-two papers were presented during six half-day sessions. One session was devoted to papers in the field of synthetic organic chemistry and among the subjects considered were: the structure of naphthenic acids, the reaction of the Grignard reagent with lactones, syntheses in the cyclobutane series, the synthesis of alkoxyacetylenes, the synthesis of "ortho" thyroxine and the constitution of arabogalactan. The mechanism of some organic reactions provided papers for a second session and the titles presented dealt principally with the hydration of ethylenic double bonds, cis-trans isomerization of ethylenic double bonds and cyanohydrin formation. In the third session allotted to organic chemistry, papers which considered some of the reactions of hemoglobin, myosin, pituitary lactogenic hormone, glutathione and chlorophyll were read. In addition to the above there were interesting accounts of researches on the provitamin-A content of American whole-wheat flour, the non-enzymatic darkening of fruits and the digestibility of proteins.

The remaining three sessions were allotted to papers in the field of physical and inorganic chemistry. In the first session of this group a number of papers on the molecular structure of some organic and inorganic compounds were given and in addition one paper described the use of punched cards in calculations of molecular structure. A second session was devoted to the presentation of papers dealing with radioactivity and thermochemistry and among the topics considered were: fission products from uranium 238, chemistry of radio hydrogen (tritium), the heat capacity of gaseous paraffin hydrocarbons, the entropy of methyl mercaptan and the thermal decomposition of dimethyl acetal. The final session was devoted to the consideration of such papers as the quantitative stability relationship between the various forms of silica, the mercurous bromide electrode, the dissociation of salts in solvents of low dielectric constant and the use of phase diagrams in the classification of liquid crystalline phases.

In addition to the above a number of laboratory demonstrations were arranged in both physical and organic chemistry and the meeting was concluded with a joint dinner with the Southern California section of the American Chemical Society.

American Meteorological Society

(Report by G. M. Sheldon, Jr.)

The Pasadena meeting of the American Meteorological Society, held in conjunction with the meeting of the Pacific Division of the A.A.A.S., was well attended and all the seventeen papers presented, during the four half-day sessions, were of exceptional interest. The meeting was closed with a luncheon Friday noon, after which was shown a motion picture in color on "Cold Front Phenomena."

The largest group at any one session was the approximately two hundred who attended the symposium on long-range forecasts on Thursday afternoon. The papers covering the theory and research and the preparation of the forecasts, given by Dr. Krick, and the verification and results, given by Mr. Elliott, brought forth considerable comment and discussion.

The papers presented covered four general fields of research, namely, radiation and fogs, illumination climate, long-range forecasts and convective showers and thunderstorms.

The officers of the Los Angeles Seminar for the coming year were introduced: *Chairman,* Dr. J. Bjerknes, University of California at Los Angeles; *Vice-Chairman,* Kenneth Fink, of the U. S. Weather Bureau at Los Angeles; *Secretary-Treasurer,* D. C. Tandy, of the American Airlines, Inc., at Burbank.

American Physical Society

(Report by Paul Kirkpatrick)

Sessions for the presentation of brief contributed research reports were held on Wednesday, Thursday and Friday forenoons. These reports, thirty-five in number, touched upon theoretical and experimental investigations in varied fields, with purely theoretical papers concentrated in the Wednesday morning program. Diverse topics were grouped in the Thursday program, while Friday's session consisted of x-ray and spectroscopic contributions.

Two symposia concerned with applications of physics in adjacent fields were presented at the Wednesday and Thursday afternoon sessions. On Wednesday the society met in joint symposium with the Astronomical Society of the Pacific to consider dynamical phenomena of atmospheres in general and specifically that of the sun, earth and other planets. Papers by J. Holmboe, J. Strong, E. C. Slipher and S. B. Nicholson were heard. The symposium of Thursday afternoon upon electron microscopes was addressed by Otto Beeck, Alfred Marshak and William V. Houston. Many industrial, biological and chemical applications, projected and accomplished, were presented. A motion picture of the RCA electron microscope was shown. Following the symposium the audience was invited to witness Professor Houston's two-stage electron microscope in operation.

On Wednesday evening a joint dinner was held with the Astronomical Society of the Pacific; and at a physics luncheon on Thursday the group was addressed by President George B. Pegram, of the American Physical Society.

American Phytopathological Society, Pacific Division

(Report by C. E. Yarwood)

The society held four half-day sessions for submitted papers; a symposium, with certain other societies, on "Micronutrient Deficiency Diseases of Crops," under the chairmanship of D. R. Hoagland; an evening dinner meeting with entertainment provided by the membership; and a field trip under the direction of K. F. Baker. Of the twenty-nine volunteered papers, twelve were on virus diseases, nine on fungous diseases, five on plant disease control, two on diseases caused by nematodes and one on non-parasitic diseases. Among the more outstanding papers were one by M. B. Linford on the mechanism of feeding of nematodes, one by D. E. Bliss on artificial inoculation of plants with *Armillaria mellea,* one by L. C. Cochran and L. M. Hutchins on a wide-spread ring spot virosis on various species of *Prunus* and one by W.

N. Takahashi on a virus inactivator obtained from yeast. Fifty-one members and several non-members registered at the sessions.

Officers of the society for the ensuing year are as follows: *President,* R. B. Streets, University of Arizona, Tucson; *Vice-President,* L. D. Leach, University of California, Davis; *Secretary-Treasurer,* C. E. Yarwood, University of California, Berkeley; *Councilor,* N. J. Giddings, U. S. Department of Agriculture, Riverside.

AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE, WESTERN SECTION

(*Report by W. W. Aldrich*)

This was the third annual meeting of the Western Section. The program included a joint symposium, five half-day sessions for the forty-one submitted papers, including one joint session with the Western Section of American Society of Plant Physiologists, the annual dinner and a tour of the U. S. Regional Salinity Laboratory and the Citrus Experiment Station, at Riverside.

The program was started with the joint symposium with the Western Society of Soil Science, American Society of Plant Physiologists and the American Phytopathological Society upon "Micronutrient Deficiency Diseases of Crops." Dr. W. H. Chandler discussed recent developments in the study of zinc deficiency. Reviews of boron deficiency conditions in the Northwest and boron and copper deficiency conditions in vegetables in the East, were given by Dr. E. L. Overholser and Dr. J. E. Knott, respectively. Dr. J. P. Bennett reported his results on iron deficiency in relation to manganese. Professor W. T. McGeorge discussed the soil chemistry phases.

The eight submitted papers on "Fruit Physiology," presented on Wednesday afternoon, covered climacteric respiration curves for the avocado, effects of methyl bromide upon deciduous fruits, relation of date fruit thinning to fruit quality, reduced date fruit cracking with reduced water supply to fruit, pecan nut filling in relation to tree vegetativeness and pear fruit growth in relation to water supply.

The Thursday morning session, with submitted papers on mineral nutrition, was outstanding. Symptoms of manganese deficiency in walnut and citrus were well illustrated. The growth of deciduous fruit trees and of field crops in the now famous Aiken loam at Paradise, California, was reviewed. The effects of inorganic and organic nitrogen fertilizers upon lettuce, the effects of high salt concentrations in solution culture upon tomato, and the high boron requirement with low calcium for table beets in sand culture, were covered by three very interesting papers.

Of the seven papers on Thursday afternoon and the ten papers on Friday morning, one showed the effect of organic matter in increasing water penetration, two reported methods of studying soil moisture depletion by citrus, four were upon delayed foliation and one upon relative resistance to powdery mildew by delphinium species. These sessions had an average attendance of fifty-three.

At the Friday afternoon session a paper reporting reduced growth of tomato, lettuce and Bermuda grass at pH 3, 4 and 9, as compared to good growth at pH 5 to 8, was particularly interesting. A preliminary report upon severe citrus pruning stimulated considerable favorable discussion.

Officers for the coming year, elected at the dinner on Friday evening, are: *Chairman,* A. C. Hildreth; *Vice-Chairman,* F. M. Coe, and *Secretary-Treasurer,* J. H. MacGillivray.

AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS, WESTERN DIVISION

(*Report by Richard S. Croker*)

The meetings of the Western Division, American Society of Ichthyologists and Herpetologists, were featured by three symposia and a half-day session of general papers. The first symposium was on introduced fishes in the waters of the Pacific Coast. Papers were presented by Brian Curtis, W. A. Dill, W. M. Chapman, G. H. Clark, and P. R. Needham and Osgood Smith. The consensus of opinion expressed was that the introduction of exotic fishes had been a worthwhile success. The symposium on rattlesnakes and other pit vipers featured papers by R. Maslin, A. W. Herre, H. S. Fitch, L. M. Klauber and C. B. Perkins. Fitch's field study provoked a great deal of discussion. The final symposium was a joint session with the Western Society of Naturalists, and was entitled "Africa, Zoologically Speaking." The high light was a paper by Bailey Willis on geology and evolution in the Dark Continent. Other papers on evolution were by C. Stock concerning mammals and G. S. Myers on fishes. R. B. Cowles, Sarah Atsatt and A. Van der Horst presented papers on modern Africa.

At the general session, seven papers were read. Of great interest were the remarkable photographs of breeding trout presented by Osgood Smith. An extensive exhibit of California fossil fishes was presented by Lore R. David. About 130 persons attended the symposium on Africa and about 60 were attracted to each of the other sessions.

Officers of the Western Division of the society for the ensuing year are: *President,* Margaret H. Storey, Stanford University; *Vice-President,* A. M. Woodbury, University of Utah; *Secretary,* Richard S. Croker, California Division of Fish and Game, Terminal Island, California.

Salt Lake City, Utah, will be the scene of the 1942 meetings.

AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS, WESTERN SECTION

(Report by J. van Overbeek)

The attendance ranged from 60 to 200. Three joint symposia were held and twenty-eight miscellaneous submitted papers were presented. D. R. Hoagland presided at a symposium on micronutrient deficiency diseases of crops. The characteristics of zinc deficiency, which causes more trouble in good than in poor soils and to which woody plants are more susceptible than herbaceous plants, were discussed by W. H. Chandler. E. L. Overholser reviewed boron deficiency in the Northwest, while J. E. Knott discussed copper, manganese and iron deficiency in the East. J. P. Bennett stressed the importance of colloidal iron, which is available from pH 3 to 9. W. T. McGeorge discussed soil chemistry. F. W. Went presided at a plant hormone symposium. He discussed chemical specificity of auxins. J. P. Bennett showed evidence of a substance which breaks the dormancy of trees. James Bonner refuted the popular notion that vitamin B_1 promotes the growth of horticultural plants. J. van Overbeek discussed dwarfism in corn due to excessive auxin destruction. He also showed that injection of naphthalene-acetic acid into *Datura* ovaries produces "seeds" containing non-viable pseudoembryos. A symposium on protoplasm was headed by O. L. Sponsler, who discussed relative size of protoplasmic constituents. A. R. Moore discussed essential factors in protoplasmic movement and A. L. Cohen the causes of form determination.

Air-conditioned greenhouses and fruiting of tomatoes under controlled conditions were discussed by F. W. Went. F. T. Addicott reported reduced meristematic activity in isolated roots lacking vitamin B_6. H. E. Hayward discussed suberized layers in the root cap due to high chloride concentrations. M. A. Joslyn discussed succinic acid formation in yeast. P. W. Rohrbaugh measured biologically ethylene in motor gases. G. H. Harris found sulfur important for raspberries. A highly instructive demonstration was given by W. Z. Hassid showing that glucose phosphate is immediately converted into synthetic starch when phosphorylase is added.

A. Goetz found yeast extremely susceptible to silver ions. D. R. Hoagland and T. C. Broyer presented experiments on the importance of respiration for accumulation of solutes and permeability to bromide in roots. J. van Overbeek showed evidence for water uptake by forces other than osmosis. R. Emerson showed that phycocyanin is effective in photosynthesis. P. J. Allen found a 700 per cent. increase in respiration of wheat leaves after infection with mildew. D. M. Bonner discussed four groups of chemicals promoting growth of isolated leaf tissue. J. Bonner showed that translocation of B_1 is similar to that of other plastic materials. D. I. Arnon found that no nutrients are absorbed at pH 3, while at pH 9 only no phosphorus is absorbed. F. G. Leibig showed that small amounts of aluminum increase copper tolerance. W. W. Aldrich reported 55 per cent. starch in date trees. Soil moistures can not be controlled below field capacity, according to A. H. Hendrickson. The effect of pruning on regeneration of top growth was discussed by A. H. Cameron. O. F. Curtis found that carotenes decrease in mineral-deficient plants, while A. L. LeRosen stressed the necessity of a gene R for carotenes in tomatoes. A. S. Crafts discussed a paper by R. N. Raynor on selective weed-killing ability of phenol compounds. W. O. Williams showed improved techniques for potassium titration.

Excursions were held to Riverside and Santa Ana.

Officers for the coming year: *Chairman,* J. van Overbeek; *Vice-Chairman,* E. T. Bartholomew; *Secretary,* D. I. Arnon.

ASSOCIATION OF PACIFIC COAST GEOGRAPHERS

(Report by J. E. Williams)

The seventh annual meeting of the Association of Pacific Coast Geographers was held at the California Institute of Technology at Pasadena, California, on June 18–20, 1941, where eighteen papers and a symposium on the Pacific Basin were presented.

The first paper on "Conservation and Chorology," by Dr. Kuchler, emphasized the importance of knowing the symbiotic balance in the landscape before attempting conservation. Dr. Bissell brought out the relation of climate to the prehistoric settlement of Chaco Canyon, New Mexico. Dr. Hoover described the natural beauty of the Havasu Canyon of Arizona. Next, Dr. Martin gave an excellently illustrated paper on the Zuyder Zee Reclamation Project. The morning session was closed by a discussion of the glacial retreat in the Lake Chelan region of Washington by Dr. Freeman.

The group gathered for luncheon and were able to see Dr. Hoover's film on Havasu Canyon.

In the afternoon, Mr. Gerlach presented "The Climates of California" from the standpoint of variation between desert, steppe and Mediterranean types. The determining factors in location of early Los Angeles were outlined by Dr. Baugh. The land-forms of the San Gabriel Mountains were next analyzed from a study of their Quaternary history by Dr. Williams. A paper on the black sands and terraces of Monterey by Dr. Beard analyzed the commercial use of various minerals found there.

A preliminary report on the status of geography in the junior colleges of the Pacific Coast was given by Mr. Buoncristiani. The shearing of trees by a steady directional wind was proved to be a mechanical process, by the facts of Dr. Richardson's paper. Dr. Zierer discussed the relationship of the urban forms of Melbourne to its significance as a functional center. Dr. Spencer analyzed the effect of the present migrations in China on the Chinese culture and the absorption of the non-Chinese. The ambitious program of mapping the State of California was described by Dr. Miller, of the California State Planning Board.

The afternoon session was a symposium on the Pacific Basin, with Dr. Spencer as chairman. Contrasts of the occidental and oriental rural landscapes turned out to be more like similarities.

The president's address, given by Dr. Earle at the dinner, was an interesting study of house types, both oriental and occidental. She emphasized the function of the various house units in many localities.

The officers for the coming year are: *President,* Dr. Forrest Shreve, Desert Laboratories, Tucson, Arizona; *Vice-President,* Dr. Eliot G. Mears, Stanford University; *Secretary-Treasurer,* Dr. Willis H. Miller, California State Planning Board, Sacramento, California.

THE ASTRONOMICAL SOCIETY OF THE PACIFIC

(Report by R. E. Wilson)

A joint session with the American Physical Society was held on Wednesday afternoon, June 19, to hear a symposium on "The Dynamics of Atmospheres." Dean George B. Pegram, of Columbia University, president of the Physical Society, presided. The attendance was about 150. The theory of the hydrodynamics of rotating atmospheres was presented by J. Holmboe, of the University of California at Los Angeles, and John Strong, of the California Institute of Technology, discussed the emission and absorption of infra-red radiation in the earth's atmosphere. E. C. Slipher, of the Lowell Observatory, summarized the work of many years at that institution on the atmospheres of the planets, his many excellent photographs revealing marked changes from day to day, notably in the polar caps of Mars. The remarkable changes continually taking place on the surface of the sun were illustrated by photographs and discussed by S. B. Nicholson, of the Mount Wilson Observatory.

Three sessions for papers were held under the chairmanship of A. S. King, R. J. Trumpler and W. S. Adams. The average attendance was about 55. The twenty papers presented covered a rather unusual variety of subjects from instrumentation to theory and from terrestrial phenomena to the extragalactic nebulae. Edison Pettit described a new polarizing monochromator for viewing solar prominences. This instrument was in operation on Mount Wilson on Thursday and aroused considerable interest. F. Zwicky described a mosaic grating for use with the Schmidt telescope. Among the papers of special interest relating to the sun were descriptions by Mary F. Coffeen of a new table of solar wave-lengths in the infra-red, a cooperative work of the Mount Wilson and Princeton Observatories, and by H. D. Babcock of a new method of measuring the sun's general magnetic field. D. R. Barber reported a significant correlation between the luminosity of the night sky and the activity of the earth's magnetic field during the preceding twenty-four hours. Andrew McKellar discussed in one paper the structure of one of the cyanogen bands in the spectrum of Comet Cunningham and in another the problem of the possible molecular identification for certain interstellar lines. Three papers dealt with eclipsing binary systems: R. M. Petrie presented evidence of apsidal motion in the orbit of AR Cassiopeiae; A. H. Joy discussed the absolute dimension of WW Draconis; and O. C. Wilson showed from observations of ζ Aurigae at the 1939–40 eclipse that both the turbulence in the atmosphere of the larger star and its excitation temperature increase with height. A. van Maanen announced the discovery of more than two dozen new faint members of the Pleiades cluster, extending knowledge of the content of that interesting assembly to stars of photographic magnitude 17.5. Two papers on the motions of the long-period variable stars by P. W. Merrill and R. E. Wilson pointed out a marked dependence of the dispersion in the radial velocities on the period of light variation, an asymmetry in motion apparently associated with galactic rotation, and a definite correlation between their mean luminosities and periods. R. Minkowski presented evidence that there are two and possibly three kinds of supernovae. Carl K. Seyfert suggested that broad emission lines found in the spectra of the nuclei of three extragalactic nebulae, lines commonly found narrow in galactic planetary nebulae, may be broadened as the result of the motions of the stars or gases in the nuclei.

An informal dinner with the American Physical Society was held at the Athenaeum on Wednesday evening. The last session for papers was held in the auditorium on Mount Wilson, after which the various telescopes and pieces of equipment were on display. The observatory was host to the members of the society for a supper at the monastery, after which the 100- and 60-inch telescopes were opened for observations. On Friday about 35 of the members took a trip to Mount Palomar, where the 200-inch and the Schmidt telescopes were exhibited by members of the staff.

BOTANICAL SOCIETY OF AMERICA, PACIFIC SECTION

(Report by Ira L. Wiggins)

The program of the Pacific Section consisted of two symposia, three half-day sessions for the presentation of submitted papers, a luncheon attended by members of the American Society of Plant Taxonomists and other botanists and a field trip to the Rancho Santa Ana Botanic Garden.

The Wednesday morning program of submitted papers dealt with genetic and cytological problems and that of Thursday morning contained papers on morphology and anatomy of flowering plants, the effect of ethylene chlorhydrin on potato tubers and algological investigation on the Pacific Coast of North America. No program was scheduled on Wednesday afternoon in order that members of the Botanical Society might visit the U. S. Regional Salinity Laboratory at Riverside, California.

A joint symposium with the Western Section of the American Society of Plant Physiologists on Thursday afternoon, June 19, considered plant hormones, with F. W. Went, J. P. Bennett, James Bonner and J. van Overbeek presenting stimulating papers.

The symposium on protoplasm held jointly with the American Society of Plant Physiologists on Friday morning included four interesting papers by O. L. Sponsler, A. R. Moore, S. C. Brooks and A. L. Cohen. The molecular, colloidal and physical properties of protoplasm, the role of protoplasm in regulating cellular permeability and the organization of protoplasm as revealed by studies on slime molds were discussed.

The final session for presentation of submitted papers was held on Friday afternoon, June 20. A paper dealing with the ecological relationships among certain desert plants presented by F. W. Went excited considerable discussion as did one reporting results of experiments on the germination of seeds of native California plants. Other papers dealt with the taxonomy and geographical distribution of the *Saprolegniaceae* and of several groups of flowering plants.

At the annual business meeting held on Thursday morning, the following officers were elected: *President,* C. E. Owens; *Secretary-Treasurer,* Basset Maguire: *Council Member,* P. A. Munz.

Through the generosity of Mrs. Susanna Bixby Bryant, director, an extremely interesting visit and a delightful luncheon at the Rancho Santa Ana Botanic Garden were enjoyed by about twenty-five members of the Botanical Society and of the American Society of Plant Physiologists on Saturday.

CALIFORNIA ACADEMY OF SCIENCES

(Report by Joseph Goodman)

The California Academy of Sciences sponsored a symposium on "Natural Illumination" on Wednesday morning, June 19. About 75 persons were in attendance. A. Breese explained the concept of illumination climate. R. C. Miller reported on the behavior of birds, insects and other organisms with reference to morning and evening twilight. H. F. Blum discussed the possible role of the shorter wave-lengths of sunlight in causing cancer of the skin.

The symposium concluded with a round table discussion by biologists, physicists and meteorologists of the need for a coordinated program for the measurement of solar radiation as received at the earth's surface. A resolution was introduced and unanimously passed requesting Dr. R. C. Miller as director of the California Academy of Sciences to form a committee under the auspices of the academy to work out such a program on the widest practicable basis.

ECOLOGICAL SOCIETY OF AMERICA, WESTERN SECTION

(Report by H. de Forest)

Twelve papers reporting research were presented in two half-day sessions, with the fields of animal and plant ecology represented about equally. Interesting brief discussions followed most of these papers.

In addition seven papers were given in two symposia. One of these, on "Ecological Aspects of Evolution," attracted a particularly large attendance. This symposium comprised papers by W. M. Hiesey on the relations between climate and intraspecific variation in plants, by G. L. Stebbins on polyploid complexes in relation to ecology and the history of floras, by A. H. Miller on habitat selection among the higher vertebrates and its relation to intraspecific variation, and by J. van Overbeek on physiological aspects of the problem of ecology and evolution. The second symposium, on "The Development of Quantitative and Experimental Work in Ecology," consisted of papers by W. D. Billings on quantitative correlations between vegetational change and soil development, J. S. Horton on quantitative analysis of chaparral by quadrats, and L. R. Penner on effects of temperature and moisture on the distribution and incidence of parasites.

A pleasant ecologists' luncheon was held on one of the meeting days.

THE OCEANOGRAPHIC SOCIETY OF THE PACIFIC

(Report by C. L. Utterback)

The program of the sixth annual meeting of the Oceanographic Society consisted of a symposium on "Coastal Currents of North America," a half-day session of contributed papers, and the annual luncheon and business meeting.

The symposium papers were prepared by Dr. R. H. Fleming, of the Scripps Institution of Oceanography, O. E. Sette, of the United States Fish and Wild

Life Service, and Dr. Richard Van Cleve, of the California State Fish and Game Commission. Due to the absence of Dr. Fleming, his paper was presented by H. U. Sverdrup. The speakers described the distribution of the halibut eggs and larvae in relation to the ocean currents in the region of Cape St. James on the southern end of Queen Charlotte Island and the distribution of the pilchard eggs and larvae in relation to the ocean currents off the coast of Southern California. The papers were followed by a discussion of various parts of the researches.

The Thursday afternoon program of contributed papers concerned different phases of oceanography. Dr. B. Gutenberg presented some of the results of his researches on earthquakes and submarine topography. An interesting account of ten years with the *Valero III* was given by Dr. C. M. Fraser. Other papers were concerned with certain aspects of the chemistry of the ocean. Two other papers presented results of studies of current configuration in selected areas.

At the annual business meeting on Wednesday noon the following officers were elected: *President,* Dr. R. C. Miller, director of the California Academy of Science; *Vice-President,* Professor A. H. Hutchinson, of the University of British Columbia; *Member of the Executive Committee* (two-year term), Dr. Richard Van Cleve; *Secretary-Treasurer* (three-year term), Professor C. L. Utterback, of the University of Washington.

Society of American Bacteriologists, Northern California-Hawaiian Branch, Southern California Branch

(Report by Ruth L. Conrad)

The two western branches this year combined to present a program of wide interest range at their half-day session.

Dr. M. Ball pointed out that an unknown growth factor exists in serum, probably non-protein in nature. It has a greater growth-stimulating effect than nicotinic acid.

A new mold in the field of allergy, *Epicoccum,* was reported by Dr. O. A. Plunkett to have air-borne spores prevalent in May rather than in October, the peak for most mold spores in the Los Angeles area.

The sensitivity of pneumococci to sulfapyridine was of general interest. Dr. F. J. Moore described a rapid qualitative test for resistance based upon the inoculation of sputum into treated and untreated mice. It was found that patients fall into four groups in respect to their response to chemotherapy.

The isolation of phages from normal strains of *Staph. aureus* and the failure to detect them on strains of *Staph. albus* was reported by Dr. Roy T. Fiske.

The report of Dr. W. W. Smith that hydrogen zeolites are more superior to sodium zeolites in lowering the bacterial count of water was of particular significance because of the arrival that day of the Colorado River water.

Dr. G. A. Matson came from Salt Lake City to tell us of his work on determining the racial purity or crossing among some of the Indians by means of the blood groups.

Tissue selectivity of strains of *Torula histolytica,* incidence and control of avian Salmonella infections, the marked reduction of bacterial flora of mackerel due to fast-freezing, studies on hydrogen sulfide production, the use of marked antigens and the oligodynamic action of silver were also reported.

Following the meeting, members of the group enjoyed a luncheon at the Athenaeum.

Society for Experimental Biology and Medicine

(Report by D. M. Greenberg)

The Pacific Coast and Southern California branches of the Society for Experimental Biology and Medicine held a joint meeting on Friday afternoon, June 20. The officers of the Southern California Branch, Dr. Emil Bogen, *Chairman,* and Dr. Max S. Dunn, *Secretary,* conducted the program.

About one hundred were in attendance and interest was maintained throughout the whole of the program. Thirteen scheduled papers on subjects ranging from parasitology to biochemistry and biophysics were presented.

The variety is shown by the following topics covered: "Does *Trypanosoma cruzi* Chagas exist in man in the United States?" by S. F. Wood; "A comparison of the chemical and biological changes in beans produced by fertilization with the excreta of cats fed on adequate and deficient diets," by F. M. Pottenger, Jr., and D. G. Simonson; "Hemorrhage control in *Eimeria tenella* infected chicks when protected by the antihemorrhagic factor, Vitamin K," by F. M. Baldwin, O. B. Wiswell and H. A. Jankiewicz; "A study of carbohydrate metabolism in subacute thiamin deficiency," by H. A. Harper; "The comparative glycogenic and ketolytic activity of the hexitols," by C. Johnson and H. J. Deuel, Jr.; "The strength-duration curve of nerve excitation by means of electrical fields," by J. A. Gengerelli; "The effect of Higueronia on the nemathelmintic gastric ulcers of California sea lions," by C. M. Herman; "The effect of decomposition on brain tissue," by W. A. Hilton; "Tracer studies with induced radioactive isotopes of the permeability of the blood-cerebrospinal fluid barrier to ions," by D. M. Greenberg, R. B. Aird, M. D. D. Boelter, W. W. Campbell, W. E. Cohn and M. M. Murayama; "Effects of x-rays and neutrons on chromosomes and on phos-

phorus metabolism of nuclei," by A. Marshak; "Protein and energy utilization in riboflavin-deficient chicks," by M. Kleiber and T. H. Jukes; "Some analyses of purified poliomyelitis virus," by Hubert S. Loring and C. E. Schwerdt; "The effect of a water-soluble lemon peel extract on the circulatory system," by A. J. Leser, C. F. Lombard, C. H. Thienes, C. Wawra and J. L. Webb.

At the end of the afternoon session, a dinner was held for the group.

WESTERN SOCIETY OF SOIL SCIENCE

(Report by W. P. Martin)

The meetings of the Western Society of Soil Science were featured by a larger attendance, a more diverse program and greater discussions than heretofore. Approximately eighty soil scientists listened to and discussed thirty-one papers on current research during four half-day sessions. In addition to the above, six papers were presented during a symposium on deficiency diseases of plants under the chairmanship of D. R. Hoagland in which the soil scientists collaborated with the plant pathologists, the plant physiologists and the horticulturists.

Papers ranged from a description of the physical and chemical characteristics of mature soil profiles by J. Thorne to studies on the effect of root-nodule bacteria on seed pea production by S. C. Vandecaveye. Early sessions were devoted principally to the physical properties of soils, with papers being presented by J. E. Fletcher, L. H. Smith and P. I. Vlasoff, of the Soil Conservation Service, and O. W. Israelsen, G. B. Bodman, L. T. Kardos and J. P. Martin, of the State Agricultural Experiment Stations. Numerous papers presented various aspects of the moisture problem in Western soils; R. E. Moore, P. R. Day, J. R. Furr, L. A. Richards, R. F. Reitemeier, M. R. Huberty, T. F. Buehrer and I. S. Vanoni were active in this respect.

Papers on the significance of Donnan equilibria in soils and errors inherent in the interpretation of pH measurements were given by L. E. Davis and P. R. Stout. J. P. Conrad, A. B. Caster, W. P. Martin, J. S. Jones, D. W. Thorne and L. T. Kardos presented papers on the retention by soils of the nitrogen of amino acids, nitrite build-up in the oxidation of ammonia and a threshold pH for same, organic matter changes in dry farm soils, and both zinc deficiency and arsenic toxicity in soils, respectively. Two related papers on plant tissue analyses as an aid to diagnosing nutrient deficiencies of crops and the potash content of citrus trees in relation to the supply in the soil were presented by A. Ulrich, S. M. Brown and H. D. Chapman.

At the banquet on Tuesday evening, Dr. L. D. Batchelor, director of the Citrus Experiment Station at Riverside, discussed the work of the station relative to the fertilization of citrus trees, and M. E. McCollam showed a colored motion picture entitled: "Fertilizer experiments with Ludina clover pastures." Seventy persons were in attendance.

An interesting field trip to visit the laboratories of the United States Regional Salinity Laboratory and the Citrus Experiment Station at Riverside was made on Wednesday afternoon.

Officers of the society for the coming year are as follows: *President,* L. C. Wheeting, Washington State College, Pullman; *Vice-President,* T. L. Martin, Brigham Young University, Provo, Utah; *Secretary-Treasurer,* W. P. Martin, University of Arizona, Tucson.

OBITUARY

ERHARD FERNHOLZ

THE death of Dr. Erhard Fernholz occurred as the result of accidental drowning at Princeton, New Jersey, on December 14, 1940. Dr. Fernholz was born at Hiddenhausen, Westphalia, Germany, on June 9, 1909, and graduated from the Realgymnasium of Bünde in 1928. He received the degree of doctor of philosophy from Göttingen with highest honors in the Faculty of Mathematics and Natural Science in November, 1932, and during the following year worked on a stipend with Professor Windaus. From October 1, 1933, until March, 1935, he was university assistant in the Chemistry Faculty of Göttingen, in charge of the Biochemical Department of the Organic Chemistry Laboratory. In the spring of 1935 he received a fellowship from Princeton University on funds given the university by Merck and Company and came to this country to work in the Chemistry Department, where he was associated with Professor E. S. Wallis.

In the course of eight years, Dr. Fernholz contributed more than forty papers to the chemical literature. At an early date he established himself as an uncommonly original and able investigator. Most of his earlier work was concerned with the sterols and bile acids, and he was soon recognized as a leader in this field. His work on the constitution of stigmasterol led directly to the first successful partial synthesis of progesterone, accomplished independently by Fernholz and by Butenandt. This work established the structure of progesterone proposed by Slotta.

After coming to the United States, Dr. Fernholz continued to contribute papers on the steroids and maintained an active interest in the field. It was his desire to determine the structure of the more impor-

ant phytosterols, many of which are but poorly characterized.

In addition to his contributions to the steroid field, Dr. Fernholz performed outstanding research on other natural products. Soon after joining the research staff of Merck and Company, in 1937, he reported the isolation of durohydroquinone from the thermal decomposition products of α-tocopherol, the most active principle of Vitamin E concentrates. This furnished the essential clue to the structure of α-tocopherol, and in 1938 enabled Dr. Fernholz, almost entirely on the basis of his own experiments, to announce the complete structure of α-tocopherol. Subsequent work from other laboratories has completely confirmed this structure.

Early in 1938, Dr. Fernholz became head of the Division of Organic Chemistry of the newly founded Squibb Institute for Medical Research. While continuing his active interest in steroids, he also turned his attention to the Vitamin K problem, and with his colleagues contributed eight papers concerned with the chemistry of antihemorrhagic substances. He was the first to recognize that 2-methyl-1,4-naphthoquinone was biologically more active than the natural Vitamin K_1, a phenomenon unique among physiologically active natural substances.

Dr. Fernholz possessed the ability to visualize a research problem in its correct perspective, and therefore was able to reduce essential laboratory work to a minimum. It is not mere rhetoric to say that science has suffered a severe loss in his untimely death. More than that, all those who have had the privilege of being associated with him as colleagues or of being counted among his friends are acutely aware of a great personal loss.

GEORGE A. HARROP
HOMER E. STAVELY
THE SQUIBB INSTITUTE FOR MEDICAL RESEARCH

RECENT DEATHS

DR. ROBERT THOMAS HILL, geologist of the U. S. Geological Survey from 1889 to 1904, died on July 28 in his eighty-third year.

DR. JOHN FRANCIS WOODHULL, professor emeritus of physical science at Teachers College, Columbia University, from 1888 to 1922, died on July 27 at the age of eighty-four years.

DR. JOHN PRICE CROZER GRIFFITH, emeritus professor of pediatrics in the Graduate School of Medicine of the University of Pennsylvania, died on July 28. He was eighty-five years old.

DR. MAX AARON GOLDSTEIN, the otolaryngologist, founder and director of the Central Institute for the Deaf at St. Louis, died on July 27 at the age of seventy-one years.

BENJAMIN LEE WHORF, assistant secretary of the Hartford Fire Insurance Company, research fellow of the Committee on American Native Languages of the American Council of Learned Societies, known for his work on Aztec and Mayan civilizations, died on July 26. He was forty-four years old.

DR. EDITH FORD SOLLERS, assistant professor of chemistry at Connecticut College, died in Baltimore on July 27 from injuries sustained in a laboratory accident while she carried on voluntary research in connection with the National Defense program.

PROFESSOR MYRON HARMON SWENK, chairman of the department of entomology of the University of Nebraska, died on July 17 in his fifty-eighth year. He became a member of the department of entomology in 1907 and was appointed chairman of the department in 1922, a position which he retained until the time of his death. According to a correspondent, "throughout the course of his professional career he has been actively engaged in both teaching and research and has contributed a large number of publications on various phases of entomology, particularly in the fields of economic entomology and taxonomy. In addition, he has published numerous articles in the fields of ornithology and mammalogy. In the death of Professor Swenk the University of Nebraska has lost one of its outstanding men."

A CORRESPONDENT writes: "The recent death of James Henry Blake, zoologist and artist, at the age of 96, removes almost the last of Louis Agassiz's students and coworkers. Mr. Blake was a student at the Penikese Laboratory and a member of the Hassler Expedition in 1871–72. He was also one of the artists for the famous Vineyard Sound Survey of the U. S. Fish Commission. At the time of his death, he was the senior member of the Boston Society of Natural History (elected 1870), in which he had held various offices. In addition, he was a founder and former president of the Boston Malacological Club. His lifelong interest in whales and mollusks is fittingly perpetuated by a large collection of his colored drawings in the New England Museum of Natural History."

SCIENTIFIC EVENTS

THE ROYAL COLLEGE OF SURGEONS

DAMAGE caused to the Royal College of Surgeons, London, has been recorded in SCIENCE. Further particulars are given by the London correspondent of the *Journal* of the American Medical Association, who writes:

The lecture room, where discourses have been heard for a century from almost all the leaders of British surgery, is now a charred ruin. The main block of the library remains with books still on the shelves, but its state is too dangerous for use. Nearly ninety thousand volumes had been sent to various parts of the country after damage by blasts from a previous raid. The transfer was aided by a grant from the Rockefeller Foundation. The principal treasures of the library had been sent away before the outbreak of the war. But the museum, which possessed treasures such as no other country could boast, has suffered irreparable loss, although many of the most valuable specimens were saved by having been placed in a tunnel below the basement surrounded with sand. The basement covers a wide area, and most of it escaped the fire that occurred. Many rooms, cellars and tunnels connected with it, which had been reinforced, were used for other specimens, which were not damaged. The important college records and historical documents had been sent away. But the working records dealing with the specimens, saved in the basement and subbasement, and the records of pathologic specimens presented to the college during the last few years were destroyed. The preservation of copies of the museum catalogues had been carefully considered and insured. All were saved except the catalogue of part of the pathologic section and that of the curio room, but nearly all the specimens in this room are described in the "Guide to Surgical Instruments and Objects in the Historical Series." Of the famous Hunterian collection, which forms the basis of the museum, no fewer than 3,750 specimens have been saved. Of the collections illustrating human anatomy only 20 specimens have been saved. Of 5,200 mammalian specimens illustrating comparative osteology only 20 or 30 remain and hardly any of 3,000 avian specimens or of the large amount of amphibian, reptile and aquatic material. The two rooms built in the middle of the last century, containing physiologic and comparative anatomy specimens, have been blasted away. Much anthropologic material has been destroyed, including the fine collection of primitive Tasmanian and Australian skulls. The greater part of the large collection of instruments is safe and can be restored. Among these are the instruments of Lister and of Moynihan, the Chinese and Japanese collections and the series illustrating the evolution of anesthetic apparatus. Though irreparable loss has been suffered, the destruction is not so great as was at first feared. Enough has been saved for the basis of a new museum, which will continue the Hunter tradition, which has always been fundamental in the college.

EXPEDITIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY

FOR the fifth consecutive season, Dr. Walter Granger, curator of fossil mammals at the American Museum of Natural History, will join a fossil-hunting expedition into the Big Badlands of South Dakota this summer. Dr. Granger left New York on July 25 for the headquarters of the expedition in Rapid City, S. D., where he will join Albert Thomson and Dr. Edwin H. Colbert, of the department of paleontology, who have been at work since early July. The greater part of the field work will be concentrated in the northwestern part of the state. From this region, one of the richest fossil beds in the world, now set apart as a National Monument, the museum has obtained since its first expedition there in 1892, valuable remains of prehistoric animals that lived in the Oligocene period.

Two unusual specimens, obtained last summer through the cooperation of the Carter County Geological Society of Ekalaka, Mont., are now being studied. One is a giant rodent larger than the present-day beaver from the uppermost Cretaceous of southeastern Montana, and the skull of a dinosaur of a new and distinct genus, but similar to the small Troödon of earlier Cretaceous formations.

The first expedition to be conducted partly on skis for the museum is now being made by Peter E. Crow of Cornell University, and Gilbert C. Anthony, of Dartmouth College, with the cooperation of the Marquis d'Albizzi, of Banff, Canada. The main object of this expedition is to make a representative collection of large and small mammals around the periphery of the Columbia Ice Field, the largest south of Alaska. With the Marquis d'Albizzi, Mr. Anthony will explore as great an area as weather conditions will permit along the fringes of the ice field, on skiis, while Mr. Crow, in the museum's station wagon, will collect mammals just off this region. The expedition will return to New York about September 1.

Mr. Michael Lerner, trustee of the museum, and Mrs. Lerner plan a hunting trip in the Yukon Territory. It is hoped to obtain two complete specimens of the Osborn caribou for a group in the North American Mammal Hall, now under construction. This caribou was first scientifically described by the late Professor Henry Fairfield Osborn, then president of the museum.

Dr. Harry L. Shapiro, associate curator of physical anthropology, is conducting a study of the Eskimos at Point Hope, Alaska. He is giving special attention to the physical anthropology of the group as a follow-up to the discoveries made last year by Dr. Froelich G. Rainey, who uncovered a prehistoric city of unknown culture on the great gravel spit of Point Hope. Dr. Rainey and Dr. Shapiro are continuing the excavation of the burial grounds.

AWARD TO THE BAUSCH AND LOMB OPTICAL COMPANY

THE U. S. Navy Department officially raised the flag of the Bureau of Ordnance and the Navy "E" pennant over the Bausch and Lomb Optical Company on August 2 "in recognition of outstanding performance in the production of ordnance materials."

The first local presentation to an industry was made Admiral W. H. P. Blandy, chief of the Bureau of dnance, who addressed some 14,000 people comsed of Bausch and Lomb employees and their milies in ceremonies in the stadium of the Rochester d Wings. The local ceremonies followed the recepn of the heads of fourteen industries by Secretary ox, who said:

In the present defense program, we've asked for racles of industrial production and what's more, we're ting them. To show our appreciation of the way erican industry has gone to bat in this emergency, the vy has decided to award the Bureau of Ordnance flag its coveted "E" to the management and men of those nts who are doing an outstanding job in the production naval ordnance material. It's our way of saying "well ne!"

According to Secretary Knox, the Navy hopes that e "E" award will be as eagerly sought by industry it is by men in the service, to which it was formerly nfined. The Navy "E" pennant has been a mark of cellence since 1906. It is usually awarded for outnding performance in gunnery, engineering, battle ractice or seamanship, and is one of the most coveted nors the Navy can bestow. It is usually painted on e funnel, mast, bridge or turret of a ship to desigte the type of operation for which it was won. ach individual in the winning crew wears the "E" on s sleeve.

Bausch and Lomb employees will wear a pin carryg the insignia of the Bureau of Ordnance and the avy "E." The company is also entitled to paint the tter on its smokestack.

In presenting the flag and "E" pennant to Herbert isenhart, president of Bausch and Lomb, Admiral landy said:

The purpose of making the award to Bausch and Lomb exactly the same as in the Navy—to provide recognition or a job well done. We hope it will provide an incentive for every producer of naval ordnance to attain similar xcellence in performing his own task for the nation's efense.

Mr. Eisenhart, president of the company, in acceptng the flag, said in part:

Ever since the Spanish American War, over forty years go, the Bausch and Lomb Optical Company has been ooperating with the Navy Department in the developent and perfection of the fire control equipment for our Navy. Then in 1912 the Navy Department stationed here at our plant a resident inspector and this has materially helped this program of cooperative experimentation and production. Continually since then, these representatives of your department have been with us and this close relationship has been cordial, constructive and most valuable.

The instruments this company produced in the war of 1917 and 1918 demonstrated the effectiveness of this program. An outstanding accomplishment of this period was the first large-scale, successful production of optical glass—the great importance of which is now so apparent to all. Then through the following years we had continued with this close cooperative procedure. And now in this time of great national need it has been and now is our privilege to demonstrate again our ability to produce these much needed instruments for both Navy and Army.

It is an honor for me to accept this pennant for the company and the employees, for it is the teamwork of this great group gathered here which has made this possible. We shall do our best to continue to justify this public recognition.

DEFENSE TRAINING COURSES OF COLLEGE GRADE

THE Society for the Promotion of Engineering Education has issued a pamphlet prepared by Dean R. A. Seaton, director of Defense Training Courses of College Grade of the U. S. Office of Education, with the cooperation of Dr. A. A. Potter, dean of engineering and director of the Engineering Experiment Station of Purdue University, and Dean G. W. Case, of the College of Technology of the University of New Hampshire and director of the Engineering Experiment Station.

Appropriations for defense training approved by President Roosevelt on July 1 amount to $116,122,000, made up of the following items:

For cost of vocational courses of less than college grade, including not to exceed $3,500,000 for rental of additional space	$52,400,000
For purchase or rental of equipment for courses indicated under (1) above	20,000,000
For the cost of short courses of college grade to meet the shortage of engineers, chemists, physicists and production supervisors	17,500,000
For the cost of vocational courses of less than college grade and related instruction for rural and non-rural youth	15,000,000
For the cost of vocational courses and related or other necessary instruction for young people employed on National Youth Administration work projects	10,000,000
For administrative expenses of the Office of Education and the Office of the Federal Security Administrator	1,222,000

Of the $17,500,000 for courses of college grade, $16,400,000 is for the training of engineers, $500,000 for chemists, $100,000 for physicists and $500,000 for non-engineering production supervisors. While this division of the fund is not specified in the act, it was clearly indicated in the congressional committee hearings.

The new program of college-grade training will be called Engineering, Science and Management Defense

Training and will be administered in the U. S. Office of Education by the same staff that has been handling the Engineering Defense Training, except that specialists in the new fields are being added.

The Advisory Committee has been enlarged by the addition of Dr. Homer L. Dodge, head of the department of physics and dean of the Graduate School of the University of Oklahoma; Dr. Clare E. Griffin, dean of the School of Business Administration of the University of Michigan, and Dr. N. W. Rakestraw, professor of chemistry at Brown University. No change is contemplated in the regional advisers. One institutional representative will, as heretofore, be named by each participating institution.

RESEARCH IN INDUSTRY

THERE was published in the last issue of SCIENCE a statement concerning the report of the survey of industrial research transmitted to the Congress by the National Resources Planning Board. The Committee on Survey of Research in Industry was composed of the following:

F. W. Willard, *chairman*, president, Nassau Smelting and Refining Company; C. L. Alsberg, director, Giannini Foundation of Agricultural Economics, University of California; C. H. Bailey, professor of agricultural chemistry and vice-director, Agricultural Experiment Station, University of Minnesota; Herbert A. Baker, president, American Can Company; Henry A. Barton, director, American Institute of Physics; L. W. Bass, assistant director, Mellon Institute of Industrial Research; Carl Breer, director of research, Chrysler Corporation; O. E. Buckley, president, Bell Telephone Laboratories, Incorporated; G. H. A. Clowes, research director, Eli Lilly and Company; W. D. Coolidge, director of research, General Electric Company; F. G. Cottrell; M. H. Eisenhart, president, Bausch and Lomb Optical Company; Charles N. Frey, director, Fleischmann Laboratories; George R. Harrison, professor and director of the research laboratory of experimental physics, Massachusettts Institute of Technology; Maurice Holland, director, Division of Engineering and Industrial Research, National Research Council; Harrison E. Howe, editor, *Industrial and Engineering Chemistry;* Jerome C. Hunsaker, professor of aeronautical engineering, Massachusetts Institute of Technology; Martin Ittner, research director, Colgate-Palmolive-Peet Company; Frank B. Jewett, vice-president, American Telephone and Telegraph Company; John Johnston, director of research, United States Steel Corporation; Virgil Jordan, president, National Industrial Conference Board; F. T. Litchfield, consulting engineer and assistant vice-president, Wells Fargo Bank and Union Trust Company; L. W. Wallace, director, Division of Engineering and Research, Crane Company; E. R. Weidlein, director, Mellon Institute of Industrial Research; Frank C. Whitmore, dean of the School of Chemistry and Physics, Pennsylvania State College; R. R. Williams, chemical director, Bell Telephone Laboratories, Incorporated.

Members of the Science Committee of the National Resources Planning Board are:

Edwin B. Wilson, *chairman*, professor of vital statistics, School of Public Health, Harvard University; Arthur L. Day, vice-president, National Academy of Sciences; David L. Edsall, dean of Harvard School of Public Health, emeritus; Edward C. Elliott, president, Purdue University; Ross G. Harrison, *chairman*, National Research Council, and professor of biology, Yale University, emeritus; Dugald C. Jackson, professor of electrical engineering, Massachusetts Institute of Technology, emeritus; Charles H. Judd, dean of the Division of Education, University of Chicago, emeritus; Dexter M. Keezer, president, Reed College; Waldo G. Leland, director, American Council of Learned Societies; Charles R. Morey, Marquand professor of art and archeology, Princeton University; William F. Ogburn, professor of sociology, University of Chicago.

SCIENTIFIC NOTES AND NEWS

DR. GILBERT N. LEWIS has retired from the administrative duties of dean of the College of Chemistry and chairman of the department of chemistry of the University of California. He will continue as professor of chemistry. Professor Wendell M. Latimer has been appointed dean of the college; Professor Joel H. Hildebrand, chairman of the department, and Professor C. W. Porter, director of the laboratory.

DR. CLYDE FISHER, curator-in-chief of astronomy and director of the Hayden Planetarium of the American Museum of Natural History, who has been a member of the scientific staff for twenty-eight years, retired on August 1 and will become honorary curator of astronomy and honorary director of the planetarium. He will be succeeded by William H. Barton, Jr., who has been executive curator of the planetarium.

DR. JAMES B. HERRICK, professor of medicine emeritus of Rush Medical College, has been elected an honorary member of the Cardiac Society of Great Britain and Ireland.

DR. NORMAN R. STOLL, associate member of the Rockefeller Institute for Medical Research, Princeton, N. J., received recently the degree of doctor of science from Mount Union College, Alliance, Ohio.

PROFESSOR J. L. MYRES and Professor R. M. Dawkins, formerly presidents of the Society for the Promotion of Hellenic Studies, went from Oxford to Boar's Hill, the home of Sir Arthur Evans, to present

to him on behalf of the society an illuminated address congratulating him on his ninetieth birthday on July 8. Professor Myres also presented to Sir Arthur an address from the British School of Archeology in Athens, of which he was one of the founders and to which he presented some years ago the site of the Palace of Knossus and his property in Crete to be a center for Cretan studies. Sir Arthur was president of the British Association for the Advancement of Science during the period from 1916 to 1919.

JULIA BELL, honorary Galton research fellow of University College, London, and member of the scientific staff of the Medical Research Council, has been awarded the Weldon Memorial Prize for 1941 of the University of Oxford.

ALFRED H. WHITE, professor of chemical engineering and head of the department at the University of Michigan, has been elected president of the Society for the Promotion of Engineering Education. H. T. Heald, of the Armour Institute of Technology, and F. L. Eidmann, professor of mechanical engineering at Columbia University, have been elected vice-presidents.

WILLARD C. BROWN, executive engineer of the Nela Park Engineering Department of the General Electric Company, Cleveland, has been elected president of the Illuminating Engineering Society, and will assume office on October 1. Howard M. Sharp, manager of the Lighting Bureau of the Niagara and Eastern Power Corporation, Buffalo, N. Y., was elected vice-president.

THE New York Psychoanalytic Society and the New York Psychoanalytic Institute have elected the following officers for 1941–42: *President,* Adolph Stern; *Vice-president,* Lillian D. Powers; *Secretary,* Philip R. Lehrman, and *Treasurer,* Samuel Atkin.

DR. WARREN C. HUNTER, for many years associated with the department of pathology of the Medical School of the University of Oregon, has been promoted to a full professorship in pathology.

DR. JACK MYERS, national research fellow in the Division of Radiation and Organisms of the Smithsonian Institution, has been appointed assistant professor of physiology at the University of Texas.

CHANGES in the department of chemistry at the Oregon State College for next year include the promotion of Dr. Bert E. Christensen from assistant to associate professor; Dr. Lloyd E. West and J. G. Roof from instructors to assistant professors, and the appointment of Dr. Max B. Williams and Dr. Allen B. Scott as instructors. Dr. William E. Caldwell, head of the division of inorganic chemistry, has been called for a year's active duty in the Chemical Warfare Service, Edgewood, Md., with the rank of major.

PROFESSOR GERMAINE GUIOT, of the department of physical education for women at the Iowa State College, has been named head of the department to succeed Professor Winifred Tilden, who has served since 1903. Professor Tilden will continue as professor.

DR. GREGORY MASON, who was organizer and leader of a number of archeological exploring expeditions to South America and Central America from 1926 to 1936, has been appointed head of the School of Journalism of New York University.

THE *Journal* of the American Medical Association reports that Dr. Myron E. Wegman, lecturer in public health in the School of Hygiene and Public Health of the Johns Hopkins University, since 1936 pediatric consultant of the bureau of child hygiene of the Maryland State Department of Health, is serving as assistant professor of child hygiene in the School of Tropical Medicine of the University of Puerto Rico, under the auspices of Columbia University, and as assistant director of the division of education and research in charge of child hygiene in the insular Department of Health.

DR. OTTO MARBURG, from 1919 to 1938 director of the Neurological Institute of the University of Vienna, has lost his case in the New York State Court of Appeals for a license to practice medicine in the state. By a vote of five to two, the Court supported the State Board of Regents and Dr. Ernest E. Cole, State Commissioner of Education, in their refusal to indorse his Austrian medical license, which would have entitled him to practice here without taking an examination. Dr. Marburg is now clinical professor of neurology at the College of Physicians and Surgeons of Columbia University, on a Rockefeller Foundation grant of $5,000, and is research neuropathologist at Montefiore Hospital, the Bronx. He came to the United States in 1938, when he applied to the Board of Regents for a license without examination. After the application had been rejected twice, he applied to the courts. He won decisions in the Supreme Court and Appellate Division, but these have now been overruled.

VERNON LAMB, instructor in physical chemistry at the University of Maryland for the past three years, has joined the section of electrochemistry of the National Bureau of Standards, Washington, D. C.

WILLIAM T. SWEENEY has resigned his position as research associate for the American Dental Association at the National Bureau of Standards, Washington, D. C., to become director of research for the Vernon-Benshoff Company, Pittsburgh, Pa.

DR. SAMUEL GELFAN has taken up his work as di-

rector of research of the Van Patten Pharmaceutical Company, Chicago.

DR. EARL N. BRESSMAN, of the U. S. Department of Agriculture, has been appointed the United States representative on the Inter-American Commission of Tropical Agriculture. This commission was established to plan an Inter-American Institute of Tropical Agriculture and to encourage rubber production in the Western Hemisphere.

CHARLES F. GOLDTHWAIT has been appointed senior cotton technologist of the new Southern Regional Research Laboratory at New Orleans of the U. S. Department of Agriculture, and is in charge of the modified finishing section of the cotton chemical finishing division. He has worked on the chemical treatment of cotton at the Mellon Institute of Industrial Research.

DR. H. H. NEWMAN, professor of zoology emeritus of the University of Chicago, on July 9 gave a convocation address before the summer session of Indiana University on "The Use of Twins in the Human Heredity-Environment Problem." In the evening he also conducted an open seminar on multiple human births.

THE eighty-ninth annual meeting of the American Pharmaceutical Association will be held at Detroit from August 16 to 23.

THE American Dental Association will hold its eighty-third annual convention in the Sam Houston Coliseum, Houston, Texas, from October 27 to 31. Headquarters will be in the Rice Hotel.

A CONFERENCE on Visual Problems was held at the Ohio State University on June 18 and 19. It brought together leading scholars actively engaged in research on various problems of vision. The participants included representatives from the fields of visual psychology, neuro-physiology, physiological optics, colorimetry, biophysics, illumination engineering, optometry and ophthalmology. Speakers on the program included Professor Selig Hecht, of Columbia University, and Professor Walter R. Miles, of Yale University.

THE Boston Society of Natural History announces that original, unpublished essays on any subject in the field of ornithology are eligible for the Walker Competition for 1942. Further information may be obtained from the Secretary, 234 Berkeley Street, Boston. The closing date is May 1, 1942.

IT was stated in a recent number of SCIENCE that the University of Texas had received a grant for the establishment of "the first laboratory of marine biology on the Gulf of Mexico." We are now informed that the Louisiana State University has maintained a class in marine biology at Grand Isle since 1928, and has occupied its own building since 1936. The laboratory has had an instructional staff consisting of members of the departments of zoology and botany, also instructors from elsewhere, and guest workers, in addition to the regular student body. This summer the staff consists of Dr. E. H. Behre, Dr. H. J. Bennett, Dr. J. H. Roberts, all of the department of zoology of the university, and Dr. Lauretta E. Fox, of the Louisiana State Normal College. The laboratory is open and available during the winter season to independent workers who may wish to use the facilities for intermittent or continuous periods.

THE third summer course in industrial statistics will be given at the Massachusetts Institute of Technology from September 8 to 20. This course is intended for workers in industrial plants and scientific laboratories who would like to acquire the rudiments of modern statistical technique as applied to inspection, to the design and analysis of factory and laboratory experiments, and to control of the quality of industrial output. The course will include lectures, discussions and laboratory work on the following subjects: judging results based on one or more small samples, identification of factors responsible for poor and variable quality, specifications and risks of producers and buyers, methods of sampling and their relationship to inspection, methods of experimenting under ordinary factory conditions, the design and analysis of small scale laboratory experiments. These methods will be applied in detail to practical problems analyzed at the institute during the past several years. Inquiries should be directed to Professor George P. Wadsworth, of the department of mathematics, or to Professor Harold A. Freeman, of the department of economics.

DISCUSSION

ILLUSIONS IN PRINTED MATTER

RECENTLY Christian A. Ruckmick[1] described an optical illusion seen when a page of typewriting on onion-skin paper is laid upon a carbon copy of the same writing. When the two sheets are about 5° from being parallel a series of white concentric circles can be seen. The circles are not complete, but are made up of a number of arcs separated from one another by intervening letters. The breaks in the circles are little more

[1] SCIENCE, 93: 2410, 236, March 7, 1941.

disturbing to the eye than are the breaks in a "dashed" curve in a graph.

Ruckmick's circles are not peculiar to himself. I can confirm him in all that he says, from having seen them many times, but can add a detail or two. It is not necessary to use onion-skin paper, for if the first sheet is rather thin and translucent, the carbon copy is not too pale, and the sheets are on a white background, the white circles are very conspicuous. The formation of an arc depends upon the alinement of spaces between words, and to be noticeable at least four lines are involved, two on the ribbon copy and their two carbon copies. Because of this, the chance of seeing arcs and circles is less with two pages of dissimilar typing than it is with Ruckmick's arrangement. In a half page of double-spaced typing, with every word having 7 or more letters, so that there were only 6 spaces on a line, there were only a few arcs. In another block of single-spaced typing, with an average of 4 letters to a word, the apparent arcs were numerous. On closer inspection they were seen to be practically straight lines, yet giving the illusion of forming broken circles.

When one of the specially typed blocks and its carbon copy are in exact register, the appearance is not unusual. If the ribbon copy is moved straight up or down about 3 mm, so that the lines are parallel to those of the carbon copy and there is no shifting to right or left, the typing will be crossed by a number of white lines at right angles to the lines of typing. Now, with the lines still 3 mm out of register and parallel, a shift of about a millimeter to the right or left will make the white lines slant in the same direction. These two shifts are for pica type and would no doubt be a little less for the smaller elite type.

Another optical effect has often forced itself upon the attention when carbon copies of letters were being handled. The copies are made on thin paper which most persons call green, but which has such a strong blue tone that at times what to call it is doubtful. If one of these sheets is lying in close contact on another on which the carbon copy is quite black, the writing can be seen through the upper sheet. In bright daylight the writing is sometimes quite noticeably red, sometimes reddish brown, or more often of no color to attract attention. For the benefit of those who may wish to think up a reason for this illusion it may be said that a thin smear of carbon black on white paper has a brownish tone, and to overcome this a violet or a red "toner," or sometimes both, must be added to the mixture that forms the coating on the carbon paper.

C. E. WATERS

WASHINGTON, D. C.

DESIGNATION OF LOCATIONS ON MAPS

AN able plea in SCIENCE of February 16, 1940 (91: 169), for "increasing the usefulness of maps" asserted that "relatively few people are accustomed to making any use of latitude and longitude in the interpretation of maps." Doesn't this point to a lack in teaching emphasis?

Why propose new schemes of fractional subdivision in thirds, ninths, etc. (SCIENCE, 93: 68)? Does the superiority of decimal subdivision need further argument? Surely the measurement of two angles (SCIENCE, 93: 523) from the lower left and right map corners involves as much work to arrive at the "typical designation: Lake Nokoni, Rocky Mountain National Park Quadrangle, L 51½°, R 56½°" as does sliding a decimally divided scale along the even ten-minute map coordinate lines and reading as directly and without further computation 40° – 15.8′ N., 105° – 42.6′ W.

It is slight criticism of the almost universally used latitude-longitude subdivisions in degrees (and decimals or) minutes and seconds, that for military purposes an overprint is added to give precise plane rectangular coordinates in addition to the polyconic projection network. Or that geographers in laying out the map of the world on a scale of 1:1,000,000 prefer to designate the Boston sheet as North K 19. Division into "arbitrary regions . . . does not meet present needs," but designation, in hundredths even if warranted, makes minutes of arc as explicit as desired.

When confronted in the field with actual fences marking the quarter section lines, we are painfully reminded that in terms of customary land subdivision Lake Nokoni is in the N.W.¼, of the S.W.¼, of Section 31, of Township 4 North, Range 74 West, in Grand County, Colorado. And if this were farming country local residents may readily tell us in which sections their respective farms lie.

But why do we continue to follow the calf path backwards, just as we continue to address our mail, listing first the things we wish to know last? The postman sorting mail wants to know first the state, second the city, third the street, fourth the number, etc. Possibly that is why we are needlessly confused in trying to locate this particular 40 acres.

ROBERT H. MERRILL

GRAND RAPIDS, MICHIGAN

INTERNATIONAL COOPERATION

ON reading Dr. A. V. Hill's essay which appeared in SCIENCE for June 20, 1941, I am led to make one small comment amplifying a parenthetical statement of fact in that article.

Dr. Hill remarks, with reference to the International Union for Mathematics, that "this last no longer exists." I have always understood that this Union lost the effectiveness it might have had and in the end went out of existence (in 1936, I believe) chiefly because the majority of mathematicians did not approve the political origins and development of the Union. However that may be, there is no question that the mathematicians of the world had every reason to be pleased with the effectiveness of that rather informal but close cooperation which, among other things, made possible their successful and important quadrennial international congresses. It would be unfortunate if any of Dr. Hill's readers should draw a contrary inference.

MARSHALL H. STONE

SCIENTIFIC BOOKS

VITAMINS

The Avitaminoses. By WALTER H. EDDY and GILBERT DALLDORF. xii + 519 pages; index, 41 plates and 28 figures. Baltimore: The Williams and Wilkins Company. 1941. $4.50.

THE first four chapters are essentially introductory in character. Chapter I, a very short chapter of eight pages called "Vitamins and Disease," is clearly and sensibly written and is admirably adapted for the orientation of the beginner seeking knowledge about vitamins. Chapter II, "The Chemical Nature of the Vitamins," and Chapter III, "Vitamins and Cellular Oxidation," are concisely and clearly expressed and adapted to the understanding of those pathologists and clinicians without profound knowledge of chemistry. Chapter III is, on the whole, a stimulating and clever job of exposition in outlining the achievements of biochemists in tracing processes involving complex compounds or systems in living tissues. Chapter IV on "Vitamin Requirements" is a seventeen-page condensed account of current information regarding human vitamin requirements, adequately documented.

Chapters V to XXII, inclusive, deal with the nature and functions of the various vitamins and the pathologic states arising from vitamin deficiencies.

Each chapter devoted to the nature and functions of a vitamin is succeeded by a chapter dealing with the respective avitaminosis as naturally occurring in man and animals, and as produced experimentally. The chapters on the avitaminoses contain very fair historical accounts of each subject and quite detailed clinical and pathological descriptions.

This arrangement or plan of the book, while a bit clumsy and leading to some unnecessary repetitions, is, on the whole, a very satisfactory device for covering a wide range of factual knowledge in an interest-sustaining manner. In the vitamin B group, pairs of chapters deal with vitamin B_1, vitamin B_2 or G or riboflavin and vitamin P-P or nicotinic acid, the anti-human pellagra—the anti-black tongue factor for dogs. "The nature and function of other members of the B-complex" and "Deficiency diseases related to the vitamin B complex" are covered in Chapters XI and XII—both rather brief though documented by satisfactory bibliographies. These two chapters require careful reading and seem less well done than those dealing with other vitamins, in part due to great condensation by the authors and in part due to the present undeveloped stage of knowledge, but on the whole they suffice to acquaint the reader with what is known about the subject-matter. Part I concludes with Chapter XXIII on "The Vitamins and Infectious Diseases," happily a short chapter, a bit speculative and not sufficiently analytical in appraisal of work cited.

Part II of the book, a total of thirty-eight pages, consists of Appendix A, on "Laboratory Tests Useful in the Diagnosis and Study of Deficiency Disease," and Appendix B, on "The Vitamin Content of Foods."

The procedures discussed in Appendix A do not represent a critical selection from the methods now available but are those, as stated in the preface, with which the authors have had experience. An expansion of this appendix with a good bibliography covering the field would have increased the value of the book.

Appendix B is composed of an impressive array of tables and apparently is adequately documented.

This book—"planned to be a helpful manual rather than a complete treatise"—achieves its purpose admirably in presenting "the field from clinical, chemical and pathological points of view." A critical reading of the book reveals many minor defects and gives the impression of having been hastily put together, somewhat carelessly in places, but nevertheless, with great ingenuity. As a compilation of factual knowledge, it is an outstanding book on the avitaminoses. As a scientific review it is inadequate in places and gives indication of the personal interests and biases of the authors.

The minor defects referred to could have been eliminated by careful reading of the manuscript by an intelligent secretary. The illustrations of the pathology, had the authors been willing to go beyond their personal work more freely, could have been much better chosen. It is to be hoped that in future editions

more and better chosen illustrations will be incorporated.

The reviewer has a guilty feeling in making these few derogatory comments because the authors have made an honest effort to achieve their purpose and have succeeded so well that the general reaction is one of gratitude for having placed on the market a book of such usefulness. The reviewer commends it to medical students and to the medical profession in general. For biochemists and pathologists it should serve to present admirable perspectives of each other's activities.

S. B. WOLBACH

HARVARD MEDICAL SCHOOL

CELLS

Unresting Cells. By R. W. GERARD. xv + 439 pp. New York: Harper and Brothers. $3.75. 1940.

THIS book is a straightforward, lucidly illustrated account of the structure, function, growth and reproduction of cells from the view-point of a physiologist. The author's reasons for writing a book of popular science are set forth in his preface as follows: "the scientist—yes, the pure scientist—is not merely justified in spending some energy on the popularization of sound science, but even more, has some duty to civilization to do so," . . . for, "scientists must help recruit men in other walks of life to the method and attitude of science in dealing with problems of state and society."

Following a brief account of the characteristic properties of protoplasm, two chapters deal with the structure and simpler chemistry of protoplasm. Enzymes, their nature and activities, are treated in a long chapter which prepares the way for an account of metabolic processes. The questions of energy sources and the conversion of energy which crept into the previous chapters are then considered, with emphasis on the concept of free energy. Thus half of the volume is devoted to the more strictly physico-chemical aspects of cells.

The remainder of the book consists of an excellent account of irritability and behavior, an account of the structure and differentiation of cells as seen through the microscope, and then proceeds to the problems of reproduction and inheritance. The latter, treated largely as problems of the reproduction and inheritance of molecules, are superbly done.

The illustrations are consistently good, the lighter note in some of the drawings serving to get the layman over certain difficult bits of terrain. The drawing for the chapter head on heredity represents chromosomes of the giant salivary gland type (which never undergo mitotic division) in the process of dividing. This is the only striking inaccuracy in the book and will prove tantalizing to those cytologists who would like to see such chromosomes undergo division. There is a good index.

This is a stimulating volume which will be read with great interest by students of science as well as the layman, for Professor Gerard writes with clarity and enthusiasm, as well as with purpose.

D. F. POULSON

YALE UNIVERSITY

REPORTS

AWARD OF GUGGENHEIM FELLOWSHIPS FOR 1941

EIGHTY-FIVE fellowships with grants of funds amounting to $180,000 to assist research and creative work to be carried on in the year 1941–42 by American and Canadian scholars and artists are announced by the John Simon Guggenheim Memorial Foundation. Last year seventy-three fellowships were granted and fifty-eight were awarded in 1939. The recipients were selected from more than fourteen hundred applicants. This is the sixteenth annual series of fellowship awards by the foundation, which was established and endowed by former United States Senator and Mrs. Simon Guggenheim as a memorial to a son.

The Guggenheim fellowships are granted to scholars and artists who by their previous work have shown themselves to be persons of unusual ability. Men and women, married and unmarried, of all races and creeds, who are citizens or permanent residents of the United States, citizens of Canada and of certain Latin American countries, are eligible on equal terms. The fellows are usually of ages between 25 and 40 years. This year their average age is thirty-six years. The stipends are usually $2,500 for a year.

Since its establishment sixteen years ago the foundation has granted 1,017 fellowships with stipends amounting to about $2,300,000.

The following fellowships in the sciences have been awarded:

DR. CORNELIUS BECKER PHILIP, medical entomologist in the U. S. Public Health Service, stationed at the Rocky Mountain Laboratory, Hamilton, Mont., who will prepare a book on ticks and their relation to animal and human disease. He will work in Mexico, Colombia and Brazil.

DR. EDWARD HOLLAND SPICER, instructor in anthropology in the University of Arizona, will prepare a comparative study of the influences of contact with other cultures upon the Yaqui Indian communities of Mexico and Arizona.

DR. ISABEL TRUESDELL KELLY, of the University of

California, who is now in the State of Jalisco, Mexico, as a Guggenheim fellow, has been granted a second fellowship to enable her to continue her ethnographic and archeologic investigations there.

DR. MARGARET H. FULFORD, assistant professor of botany in the University of Cincinnati, will make a taxonomic study of the Hepaticae—liverworts—of Mexico and Central America, with the purpose of filling a gap in the existing botanical knowledge of the region.

DR. ARISTID V. GROSSE, of the Laboratory of Physics of Columbia University, formerly associate director of research for the Universal Oil Products Company, is working on the utilization of a close relative of the element uranium, known as U–235, as a source of power. This is the second Guggenheim fellowship to assist this work.

DR. HARVEY ELLIOTT WHITE, associate professor of physics, University of California, will make a spectroscopic analysis of the gases of the volcano Mauna Loa.

DR. MERRILL KELLEY BENNETT, professor of economic geography, Food Research Institute, Stanford University, proposes to investigate representative diets in the Hawaiian Islands and to contrast these with Oriental and Occidental diets.

DR. ADRIANCE SHERWOOD FOSTER, associate professor of botany, University of California, will go to Hawaii to make a cyto-histological study of the growth of buds of tropical ferns.

DR. ROY FRANKLIN BARTON, teacher of mathematics, St. Andrew's High School, Sagada, P. I., will record and translate the "Hudhud," a series of epics chanted as work songs and at death wakes by the Ifugaos, a pagan, terrace-building people of the Philippine Islands.

DR. DOROTHY MARY SPENCER, lecturer in anthropology, University of Pennsylvania, is engaged in studying, from an anthropological point of view, the Mundas, an aboriginal people who live on the high plateaus of Bengal, India.

DR. MAUD WORCESTER MAKEMSON, chairman of the department of astronomy and director of the Observatory of Vassar College, for researches into problems of Maya astronomy.

DR. ALFRED TARSKI, refugee mathematician from Poland, where he was professor of mathematics in the University of Warsaw, studies in the field of mathematical logic and the logical foundations of mathematics.

DR. DEANE MONTGOMERY, associate professor of mathematics, Smith College, studies of the action of topological transformation groups on various types of spaces, particularly on Euclidean spaces and manifolds.

DR. RICHARD DAGOBERT BRAUER, assistant professor of mathematics, University of Toronto, studies in the field of modern algebra, with special reference to the theory of groups of finite order and their characters.

DR. JESSE DOUGLAS, mathematician, Brooklyn, research in the calculus of variation and geometry.

DR. KENNETH STEWART COLE, associate professor of physiology, Columbia University, and consulting physicist, Presbyterian Hospital, New York City, for a study of the electrical aspects of the structure and function of living nerve.

DR. BERRY CAMPBELL, assistant professor of anatomy, University of Oklahoma Medical School, for investigations of the integrative mechanisms of the spinal cord with particular reference to the basic locomotor behavior patterns. Dr. Campbell will work at the Rockefeller Institute for Medical Research with Dr. Herbert S. Gasser.

DR. BENJAMIN PAUL SONNENBLICK, research zoologist, Queens College, New York, for studies of the embryology of the fruit-fly, *Drosophila melanogaster*, with special reference to the cytology and differentiation of the organs and organ systems in the larva.

DR. HORACE ALBERT BARKER, assistant professor and assistant soil microbiologist, University of California, for researches in the field of bacteriological biochemistry.

DR. ISRAEL LYON CHAIKOFF, associate professor of physiology, University of California, for investigations with radioactive phosphorus and iodine as indicators of metabolic processes in animals and for the preparation of a monograph on the physiological and biochemical aspects of the lipid metabolism.

DR. JOHN THOMAS MEDLER, entomologist, Ruidoso, New Mexico, for an investigation of the nutritional requirements and the chemistry of salivary secretions of certain insects.

DR. ERNST CLEVELAND ABBE, associate professor of botany in the University of Minnesota, for the continuation of his researches on the bearing of historical, climatic and geological factors on the vegetation of a heavily glaciated region in the eastern subarctic.

DIETRICH BODENSTEIN, who is a technician in the biological laboratory of Stanford University, for investigations into the problem of metamorphosis in insects.

DR. WILLIAM CHRISTIAN KRUMBEIN, assistant professor of geology, University of Chicago, will investigate the dynamical processes by which sedimentary particles are abraded, changed in shape and sorted into the deposits found in nature.

DR. GEORGE PRIOR WOOLLARD, geophysicist, Princeton, New Jersey, will make seismic, gravitational and magnetic investigations of the geologic structure underlying the North American Atlantic coastal plain.

DR. SOLOMON E. ASCH will prepare a book on the formation and change of opinion and attitude.

DR. EDWARD GIRDEN will make a comparative investigation of the neuropsychological determinants of the phenomena of dissociation.

DR. GEORGE KATONA, of New York City, will continue his studies in the field of the psychology of learning.

DR. RUDOLF ARNHEIM, a refugee psychologist from Germany, will study the application of the principles and methods of Gestalt psychology to art analysis.

DR. VOLNEY COLVIN WILSON, instructor in physics, University of Chicago, a study of the development of machinery for the production of high energy x-rays.

DR. WILSON MARCY POWELL, assistant professor of physics, Kenyon College, Gambier, Ohio, cosmic ray research, in particular a cloud-chamber study of the abundance and energy distribution of slow protons and mesotrons at high altitudes.

DR. WILLARD FRANK LIBBY, assistant professor of chemistry, University of California, studies in physical chemistry, with particular reference to application of the methods of nuclear physics.

DR. VERNER FREDERICK HENRY SCHOMAKER, senior research fellow, California Institute of Technology, studies in the field of molecular spectroscopy.

The trustees of the foundation, in addition to its founders, Senator and Mrs. Simon Guggenheim, are Francis H. Brownell, Carroll A. Wilson, Charles D. Hilles, Roger W. Straus, Charles Earl, John C. Emison and Medley G. B. Whelpley. The committee of selection consisted of Dr. Frank Aydelotte, director of the Institute for Advanced Study, *Chairman;* Dr. Florence R. Sabin, of the Rockefeller Institute for Medical Research; Professor Edwin Bidwell Wilson, of the School of Public Health of Harvard University; Professor Linus Pauling, of the California Institute of Technology, and Professor Wallace Notestein, of Yale University.

The fellows chosen this year come from twenty-three states and three Canadian provinces and are on the staffs of thirty-one educational institutions. The University of California at Berkeley leads with six members of its faculty appointed to fellowship. No other university faculty received more than two appointments.

In addition to these fellowships twenty fellowships were awarded later to Latin American scholars and artists in the twelfth annual Latin American Fellowship competition. All these fellows will work in the United States, and fourteen fellows from the United States will work in various parts of Latin America during the year. The stipend of the Latin American fellowships is usually $2,000 for a year's fellowship. The twenty fellowships awarded this year are distributed as follows: eight to Brazil, four to Mexico, three to Argentina, two each to Uruguay and Puerto Rico and one to Chile. The Committee of Selection consisted, in addition to Dr. Aydelotte, *chairman,* of Dr. Thomas Barbour, director of the Museum of Comparative Zoology, Harvard University, Dr. Percival Bailey, profesor of neurology and neurosurgery, University of Illinois Medical School; Dr. Américo Castro, professor of Spanish, Princeton University, and Dr. Elmer Drew Merrill, professor of botany and director of Botanical Collections, Harvary University. In making their selections, this committee was assisted by many eminent Latin American scholars and authorities in the fields of the applicants' work.

This year's list contains the largest number of Latin American fellowships ever awarded by the foundation in any one year. With the eighty-five fellowships awarded to citizens of the United States and Canada, it brings the total number of fellows assisted by the Foundation this year to one hundred and five. The largest group of the new fellows will work in medical fields. They are:

DR. ANÍBAL SILVEIRA, neurologist at the Juquerí Hospital in São Paulo, Brazil. He will study the electrical activity of the cortex of the brain and its variations under pathological conditions. Another neurologist who has been awarded a fellowship is DR. NILSON TORRES DE REZENDE, of Pernambuco, Brazil, who will continue his investigations in the field of neuro-physiology.

Two fellows will work in collaboration with Dr. George W. Corner, director of the Laboratory of Embryology of the Carnegie Institution, in Baltimore. They are: DR. WASHINGTON BUÑO, head of the laboratory of histology, Institute of Endocrinology, Montevideo, Uruguay. Dr. Buño will conduct research into certain problems in the field of primate embryology, and DR. LUIS VARGAS FERNÁNDEZ, assistant head of the department of experimental medicine of the National Health Service, Santiago, Chile, who will carry on experimental studies in the field of endocrine pathology.

Also to further their work in endocrinology, the following fellows will come to the United States: DR. JOSÉ RIBEIRO DO VALLE, Professor in the São Paulo School of Medicine and assistant at the Butantan Institute; DR. AMÉRICO SANTIAGO ALBRIEUX MURDOCH, head of the section of endocrinology in the Institute of Endocrinology, Montevideo.

For work in biochemistry the following, both of whom are members of the staff of the Biological Institute of São Paulo, have been appointed: DR. MAURICIO ROCHA E SILVA, member of the staff, São Paulo Biological Institute, who will work at the Rockefeller Institute for Medical Research; DR. OTTO GUILHERME BIER, assistant chief, department of serology, São Paulo Biological Institute, who will make quantitative chemical studies of immunity phenomena in collaboration with Dr. Michael Heidelberger, at the College of Physicians and Surgeons, Columbia University, and DR. EFRÉN CARLOS DEL POZO, professor of physiology, National School of Biological Sciences, Mexico, will carry on studies of the electrical stimulation of muscle at the Harvard Medical School.

In engineering sciences the following fellowships were awarded: DR. AUGUSTO JOSÉ DURELLI, engineer, Buenos Aires, who will investigate the photoelastic method of determining stresses and the application of this method to practical problems in reinforced concrete design, at the Massachusetts Institute of Technology; and NABOR CARRILLO FLORES, professor of mathematics in the National University of Mexico, who will continue his studies of soil mechanics in its application to the construction of foundations of buildings and dams, at Harvard University.

For researches in physics two fellowships were awarded: DR. MARIO SCHENBERG, professor of physics, University of São Paulo, who will study the application of nuclear and atomic physics to astrophysics, and FACUNDO BUESO-SANLLEHÍ, professor of physics, University of Puerto Rico, who will continue his studies in the field of band spectra, with Professor Arthur H. Compton at the University of Chicago.

Three fellows will work on botanical problems: JUAN IGNACIO VALENCIA, of the Darwin Botanical Institute, Buenos Aires, who will continue his taxonomic and mor-

phological studies of South American forage plants in collaboration with Dr. Agnes Chase at the United States National Museum; AGESILAU ANTONIO BITANCOURT, subdirector of the São Paulo Biological Institute, who will make a study of the virus diseases of citrus and of fungus parasites on other economic plants, with Dr. H. S. Fawcett at the Citrus Experiment Station of the University of California, Riverside, and with scholars in the U. S. Department of Agriculture, and EDGARD DO AMARAL GRANER, technical assistant in the Institute of Agronomy and lecturer in the "Luiz de Queiroz" School of Agriculture, Piracicaba, Brazil. His project is to study the citogenetics of corn and tobacco chiefly with Professor T. H. Goodspeed, at the University of California.

SPECIAL ARTICLES

THE ORIGIN OF THE RETE APPARATUS IN THE OPOSSUM

THE system of male genital ducts in vertebrates is mainly derived from mesonephric structures, preserved and readapted to another function. The mesonephric duct and a number of anterior tubules become the ductus deferens and ductus epididymidis, and the epididymal tubules, respectively; while connection with the gonad is established by means of the rete elements, which occupy an intermediate position at the hilum. These elements typically anastomose freely in the hilar region but connect as discrete ductules with the prospective epididymal tubules at the glomerular capsules.

While there is agreement as to the development of ductus deferens and epididymis, the problem of the origin of the rete apparatus has received many answers. Historically, it has been derived, according to different studies, from (1) cord-like outgrowths of the glomerular capsules which penetrate the hilum of the gonad to unite with the medullary cords; (2) conversely, by extensions of the medullary cords through the mesorchium to unite with the capsules; (3) as an independent, local development at the hilum, with connections established secondarily in both directions. Considering the diversity of forms studied, the differences of opinion are not surprising. The extensive literature is best approached through the medium of recent general discussions.[1, 2, 3]

In *mammals* the problem is complicated by the rudimentary nature and transitory development of certain of the structures involved. Consequently, if we accept for the purpose of this discussion the prevailing view that the rete apparatus has an independent origin locally, we still encounter widely different opinions as to the nature and precise manner of origin of the earliest visible primordia. One view of doubtful value holds merely, (*a*) that the rete connections arise as local condensations from the primary mesenchyme; a second (*b*) derives them from an ill-organized cellular blastema, probably originating from the adjacent coelomic epithelium;[4, 5, 6, 7, 8] while a third opinion (*c*) asserts a highly specific origin from discrete epithelial cords (sometimes tubular ingrowths) arising from the coelomic epithelium of the anterior genital ridge.[4, 9, 10, 11] In the last category, the resemblance which these structures bear to abortive nephrostomes or nephrostomial canals is frequently noted and discussed; however, only one author without hesitation describes them as such.[10] If this interpretation is correct there is a considerable accumulation of evidence from a number of mammals placing this group in line with a condition clearly established in certain lower vertebrates.[12, 13] This view would also identify the rete system with other parts of the male duct system, as a transformed mesonephric structure.

Much the same problem exists regarding the origin of the Mullerian duct, in particular the ostial ingrowth. In selachians this duct is still held to arise by a gradual backward splitting of the Wolffian duct, but in higher classes it develops by invagination of a localized area of ciliated coelomic epithelium at the anterior pole of the mesonephros. The ostium thus formed gives rise to the remainder of the duct by backward growth. The invaginating epithelium has been frequently, if rather loosely, identified with one or more mesonephric (or pronephric) nephrostomes.[2, 3, 4]

In view of the interest attaching to these structures from the standpoint of comparative morphology as well as embryology, their development in the North American opossum (*Didelphys virginiana*), a primitive type of marsupial, deserves description. The process is similar to that described by Fraser[11] for certain Australian marsupials (especially *Trichosurus*),

[1] B. H. Willier, "Sex and Internal Secretions," 2nd Ed. Baltimore: Williams and Wilkins, 1939.

[2] F. W. R. Brambell, "The Development of Sex in Vertebrates," London: Sidgwick and Jackson, Ltd., 1930.

[3] E. S. Goodrich, "Studies on the Structure and Development of Vertebrates," London: Macmillan, 1930.

[4] S. E. Wichmann, *Anat. Hefte*, 45: 629, 1912.

[5] W. Felix, Keibel and Mall, "Manual of Human Embryology," II, Phila.: Lippincott, 1912.

[6] H. M. de Burlet and H. S. de Ruiter, *Anat. Hefte*, 59: 321, 1921.

[7] C. S. Simkins, *Acta Zool.*, 4: 241, 1923.

[8] K. W. Wilson, *Contr. Emb. Carnegie Inst. Wash.*, 17: 69, 1926.

[9] B. M. Allen, *Am. Jour. Anat.*, 3: 89, 1904.

[10] F. W. R. Brambell, *Proc. Roy. Soc.*, Series B, 102: 206, 1928.

[11] E. A. Fraser, *Jour. Anat.*, 53: 97, 1919.

[12] A. Brachet, "Traité d'Embryologie des Vertébrés," Paris, 1921.

[13] B. M. Allen, *Am. Jour. Anat.*, 5: 79, 1905.

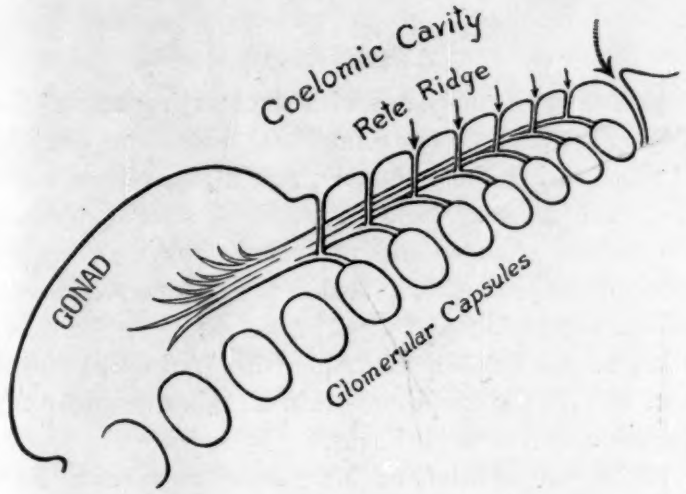
and to the brief outline given for *Didelphys aurita* by the same author; however, the clear-cut relationship of the rete cords to the coelomic epithelium, and the characteristics which relate them to nephrostomial canals, are particularly distinct in *Didelphys virginiana.*[14] The account that follows is a brief recapitulation, emphasizing features that are especially clear in the material. A full account will appear elsewhere at a later date.

At birth the genital ridge (as in Trichosurus) is already distinctly marked off into an anterior region, the *rete ridge,* slender and virtually lacking in germ cells, and a posterior *gonad region.* The latter is still sexually undifferentiated save in exceptional cases. Both gonad and rete ridge are closely applied to the ventro-medial surface of the mesonephros, in intimate relation with a series of glomerular capsules. Within the rete ridge appear numerous irregular epithelial cords, frequently in contact with one another and with the capsules. At intervals these cords are seen to reach the surface of the ridge, where they are continuous with the covering coelomic epithelium. Frequently they appear tubular even at this early stage.

Development is slow for a time, but by 10 days, when the gonads are well differentiated, the cords within the ridge form a compact bundle of rete canals, lined with a densely staining epithelium. Toward the hilum of the gonad they merge gradually into a single large duct; toward the mesonephros they diverge as discrete tubules which unite individually with glomerular capsules. The primitive connections with the coelomic epithelium are now wide, funnel-like canals (6–8 typically) lined with the same massive epithelium, which also spreads over the surface of the ridge, with an abrupt transition to mesothelium of ordinary coelomic type. Longitudinally, this epithelium forms an irregular band along the crest of the ridge, and is continuous at the anterior end of the ridge with the ostium of the Mullerian duct. It is during this period that the Mullerian duct is developing. The plan and relationships of the system, at the height of its development, are shown in Fig. 1.

At twelve to fourteen days a sex difference is usually found, although there is great variability. In most males the funnel-like ducts joining the rete canals with the coelom, are retrogressing. In some specimens they have virtually disappeared, but may be seen in others as late as twenty days. In females they remain open indefinitely and at seven weeks still retain their original relationships, opening on the surface of the mesovarium in continuity with the fimbriated margin of the ostium.

Thus in males the rete canals, in adaptation to their eventual function, lose their primary communications with the coelom comparatively early. In the female they remain open indefinitely, and the rete itself persists as a well-developed structure in the adult ovary. It has been shown that male hormones evoke this sex difference in females by effecting early closure of the



PLAN OF THE RETE APPARATUS IN DIDELPHYS VIRGINIANA

FIG. 1. Plan of the rete system in *Didelphys virginiana;* a composite of conditions encountered between 10 and 20 days, pouch life. The large arrow indicates the ostium of the Mullerian duct, small arrows coelomic funnels of the rete canals.

funnels, with development of a rete and epididymis comparable with the normal male parts.[15]

SUMMARY AND CONCLUSIONS

The rete apparatus in the opossum appears first as a series of cellular cords, or slender canals, arising from an irregular band of thickened coelomic epithelium covering the rete region of the genital ridge. At the cephalic end of the ridge this band is directly continuous with and indistinguishable from the area that gives rise to the ostium tubae. A number of these cords become canalized and appear as wide, funnel-like openings leading from the body cavity into the rete canals, which are now also tubular. During the period when the funnels are becoming patent the ostial invagination is also developing. In males the funnels retrogress early, converting the rete canals into closed passages, while the ostium tubae also atrophies. In females, in which the ostium is a functional structure, the rete invaginations also remain open indefinitely.

From the manner of origin and early relationships of these canals, from their appearance at the height of differentiation, and from their behavior during later development, it is strongly indicated that, together with the ostial invagination, they represent a series of persistent nephrostomial canals. Thus the rete canals, like other parts of the male genital duct system, are derived from preexisting mesonephric structures, while

[14] R. K. Burns, Jr., *Anat. Rec.,* 79 (Supplement), 1941.

[15] R. K. Burns, Jr., *Jour. Morph.,* 69: 79, 1939.

the individual rete invaginations and the ostial funnel are morphologically members of a homologous series.

R. K. BURNS, JR.
CARNEGIE INSTITUTION OF WASHINGTON,
BALTIMORE

ARGINASE

ARGINASE as compared with the starting material—a watery extract from ground beef liver—was purified 50 times, using the common protein separation methods. The ferment solution obtained showed absence of catalase, amylase and proteolytic enzymes. Spectroscopic examination revealed the absence of hemoglobin, myoglobin and cytochrome C.

10γ of this protein solution hydrolyzed 30 to 35 per cent. of 17.4 mg arginine within 10 minutes under the condition of the experiment.

While the addition of Mn^{++}-ions[1] to a crude liver extract is frequently without any effect upon the activity of the enzyme, it was found that in the further stages of purification Mn^{++}-ions are essential for obtaining maximum activity of the enzyme. The activation of arginase by metallic ions, for instance, Mn^{++}, is a time reaction requiring about 15 minutes under the condition of the experiment for obtaining optimum activation. The optimum pH for the purified enzyme (with or without Mn^{++}-ions) is about 9.5. Other ions, such as Fe^{++}, Ni^{++} and Co^{++} also activate the enzyme but to a less extent than Mn^{++}. Here again, however, the optimum pH for these ions was found to be about 9.5.

Arginase (no addition)	.35
" + Mn^{++}	.71
" + Mn^{++}—vitamin C	.71
" + Co^{++}	.53
" + Co^{++}—vitamin C	.56
" + Ni^{++}	.50
" + Fe^{++}	.48
" + Fe^{++}—cysteine	.59

10γ arginase; 17.4 mg arginine; heavy metal salts 0.5γ; vitamin C or cysteine 1γ; total volume 1.5 cc adjusted to pH 9.5; incubated for 10 minutes at 37.5° C. Numbers are n/20 KOH. Method of determination was the Linderstroem-Lang method[2] for titration of ornithine, modified to semi-micro.

In the purified state arginase is quite stable, tolerating dialysis for 48 hours at 4° C. without loss of activity. The ferment solution is also stable at this temperature for weeks and its activity not altered by evaporating from the frozen state to dryness and subsequent redissolving.

The isoelectric point of the enzyme was found by electrophoresis to be at pH 5.7. The investigation of the ash content of the purified enzyme gave in one case an Mn-content of 0.08 per cent.

[1] G. Klein and W. Ziese, *Klin. Woch.*, 14: 205, 1935.
[2] K. Linderstroem-Lang, L. Weil and H. Holter, *Z. physiol. Chem.*, 233: 174, 1935.

The investigation was supported financially by a Rockefeller grant.

RENATE JUNOWICZ-KOCHOLATY[3]
WALTER KOCHOLATY[3]
UNIVERSITY OF CHICAGO

THE INDUCTION OF FERTILITY IN GENETICALLY SELF-STERILE PLANTS

IN hybridization experiments designed for the production of new colors in the various classes of commercially important Petunias, a strain of Golden Rose was discovered that has been found to be completely self-sterile under natural conditions. The self-sterility in this strain of Petunia behaves in inheritance as a simple Mendelian recessive character. By means of cuttings the strain has been maintained in the Botanical Laboratory of Bucknell University for the past five years. The plants are unusually floriferous and everblooming, due, in part at least, to their inability to produce seeds unless they receive pollen from plants which are not homozygous recessive for the self-sterility gene. Although many thousands of flowers were produced during this period and although repeated attempts were made to self-fertilize the plants, not a single seed capsule was ever produced until recently when self-fertility was induced by the techniques described below.

Dr. H. Clyde Eyster, of the Botany Department of the University of South Dakota, made microscopic observations of the pollen tubes in the stigmas and styles of the self-pollinated self-sterile plants and found that the pollen grains germinate well and develop into tubes which extend into the neck of the style but rarely if ever grow as far as one half the distance from the stigma to the ovary. In styles that had been cut three days after they had been self-pollinated, Dr. Eyster found that most of the pollen tubes grow only about one tenth of the distance from the stigma to the ovary, while an occasional tube grows somewhat less than one half of the distance down the style. Before any of the tubes reach the ovary, the style is cut off from the top of the ovary by the formation of an abscission layer. From these observations it appears that the self-sterility in the Golden Rose Petunia studied is caused by the very slow rate of growth of the pollen tubes and the formation of an abscission layer which severs the style from the ovary before any of the tubes enter the latter.

The pollen of the self-sterile plants was placed on the stigmas of normal self-fertile plants and allowed to develop for forty-eight hours. At the end of this time the styles were cut, preserved and sent to Dr. Eyster for microscopic examination. Approximately 75 per cent. of the pollen grains were found to have developed pollen tubes of varying lengths, including many which extended all the way down the style and,

[3] Now at the University of Pennsylvania.

presumably, into the ovary. This result was to be expected since the pollen of the self-sterile plants causes normal seed pods with viable seeds to be produced on plants which are not homozygous recessive for the gene for self-sterility involved. So also the pollen of plants which are not homozygous recessive for the self-sterility gene develops normally in styles of the self-sterile plants. Observations of styles made forty-eight hours after they had been pollinated showed that from 75 to 95 per cent. of the pollen had germinated and had formed tubes of varying lengths, including many which extended all the way down the style.

Plants of the self-sterile strain of Golden Rose Petunia can be self-fertilized by either of two methods described below. If flower buds which are beginning to develop anthocyanin in the petals are opened and pollinated with pollen from fully opened flowers from the same plant, seed capsules containing viable seeds are produced. Similar results were found in *Petunia violacea* by Yasuda,[1] who refers to this method of self-fertilization as homo-pollination. In a more recent study Yasuda[2] found that the placenta in the overy of *Petunia violacea* secretes a "special substance" which diffuses into the style and retards or completely inhibits the germination of the pollen and the development of pollen tubes. Preliminary studies with the self-sterile Golden Rose strain of Petunia in my laboratory indicate that when the sap expressed from the ovary of self-sterile plants is placed on the stigma and style of strains which are not homozygous recessive for the self-sterility gene, the latter strains are rendered cross-sterile with the self-sterile plants. This result tends to show that the ovarian secretion which renders the plant self-sterile can be transferred to other plants and renders them cross-sterile with pollen from self-sterile plants.

The self-sterile plants can also be made self-fertile in a more simple and more remarkable manner. This may be accomplished by spraying the flowering plants with a solution composed of ten parts of alpha naphthalene acetamide dissolved in one million parts of water.[3] Flowers which are sprayed with this solution immediately before or shortly after they have been self-pollinated produce seed capsules filled with viable seeds in exactly the same way that normal self-fertile plants of other strains produce seeds. Obviously alpha naphthalene acetamide neutralizes the effects of the ovarian secretion which diffuses into the style and inhibits or greatly retards the growth of the pollen tubes. Seeds from such self-fertilized self-sterile plants were found, when planted, to grow into normal seedlings and the per cent. of germination in all trials was unusually high.

Preliminary experiments indicate that the alpha naphthalene acetamide greatly increases the self-fertility or self-compatability of highly inbred and highly sterile strains of *Tagetes erecta* (African marigolds), *Brassica oleracea* (cabbage) and *Trifolium pratense* (red clover). These results suggest that a great variety of economically important plants which are normally partly or completely self-sterile or self-incompatible may be made self-fertile by the use of a suitable solution of alpha naphthalene acetamide as indicated in the preliminary report given in this paper.

WILLIAM H. EYSTER

BUCKNELL UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW PROCEDURE FOR ADSORPTION ANALYSIS

IF a liquid containing one or more dissolved substances is allowed to pass slowly through a layer of a finely divided adsorbent, the different solutes, dependent upon the degree of adsorption, will become more or less retarded as compared to the liquid. If the solution flows upwards through the adsorbent and emerges into a vessel suitable for optical observation (for example, by the Toepler Schlieren method, as used in observations of electrophoretic migration[1]) a number of boundaries will be observed, corresponding to the number of differently adsorbable components present, and the volume of liquid between each boundary and the meniscus ("the retardation volume") will equal the ratio between the amount adsorbed and the concentration of the corresponding component.

If the mutual adsorption displacement effects are negligible the concentrations of the components in the observation tube should have the same value as in the original solution. A new method for qualitative and quantitative analysis, with a very wide field of application, may be based upon the principle described. A theoretical treatment and a description of the experimental arrangement has been given in two recent communications.[2] The method has been tried on mixtures

[1] Sadawo Yasuda, *Proc. Crop. Sci. Soc. Japan*, 2 (2): 122–126, 1930.

[2] Sadawo Yasuda, *Bot. Mag.* (Tokyo), 46 (548): 510–517, 1932.

[1] A. Tiselius, *Trans. Farad. Soc.*, 33: 524, 1937. See also The Harvey Lectures, 35: 37, 1939–40.

[3] The alpha naphthalene acetamide was used in the form of the commercial preparation known as Fruitone.

[2] A. Tiselius, *Arkiv för Kemi* (Royal Swedish Academy of Sciences), 14 B, No. 22 and No. 32. A detailed description of the method and some of its applications is to appear this year in "Advances in Colloid Science," edited

of various substances; for example, saccharides, organic acids in water or organic solvents, and some

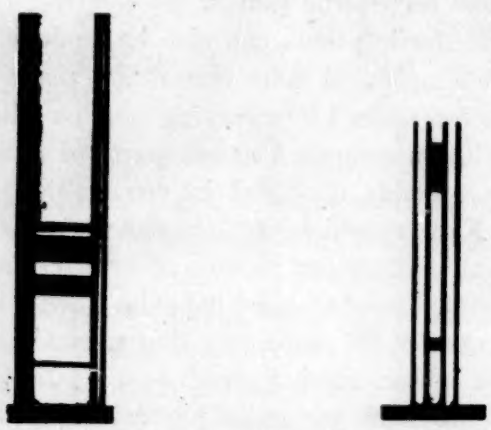


FIG. 1. Schlieren photographs of adsorption analysis. *Left:* 1 per cent. NaCl, 1 per cent. glucose, 1 per cent. lactose. Cross-section of cuvette 100 × 20 mm. *Right:* 1 per cent. NaCl, 1 per cent. glucose (the meniscus has passed out of the field of vision). Cross-section of cuvette 50 × 5 mm.

stereoismeric compounds. Fig. 1 shows a photograph obtained by the Schlieren method on a mixture of 1 per cent. sodium chloride, 1 per cent. glucose and 1 per cent. lactose, and Fig. 2 a gradient curve (photographed by the Philpot-Svensson modification of the Schlieren method) from an experiment on (left to

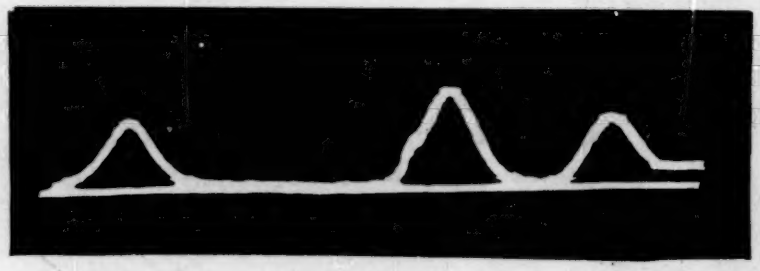


FIG. 2. Gradient curve photographs of adsorption analysis. *Left to right:* 0.5 per cent. leucine, 0.5 per cent. valin, 0.5 per cent. alanin.

right) 0.5 per cent. leucin, 0.5 per cent. valin and 0.5 per cent. alanin. The active carbon used in these experiments was packed into a cylindrical cell 20 mm in diameter and 10 mm in height between filter paper supported by perforated disks, and this cell is attached to the bottom of an optical cuvette with 50 × 5 mm cross-section area.

In Fig. 3 the retardation volumes per gram active carbon have been plotted for 0.5 per cent. solutions of a number of amino acids and peptides. The first two rows were obtained in neutral solutions with "Carbo Active Kahlbaum" the last row in alkaline and acid buffer solutions on "Eponit 3n" of the Lurgi G.m.b.H.

Adsorption displacement effects in mixtures tend to make the observed concentrations too large for the less adsorbable components. To avoid this one should try to choose the conditions such as to give relatively small occupation of the available adsorbing surface area. Thus, low concentrations, or extreme pH-values at which the adsorption is considerably diminished are to be preferred. Eventually one may extrapolate to zero from two determinations at different total concentrations. Concentration determinations on the successive layers are made on samples collected in a container on top of the observation cuvette, or may be obtained by integration of the gradient curves (Fig. 2).

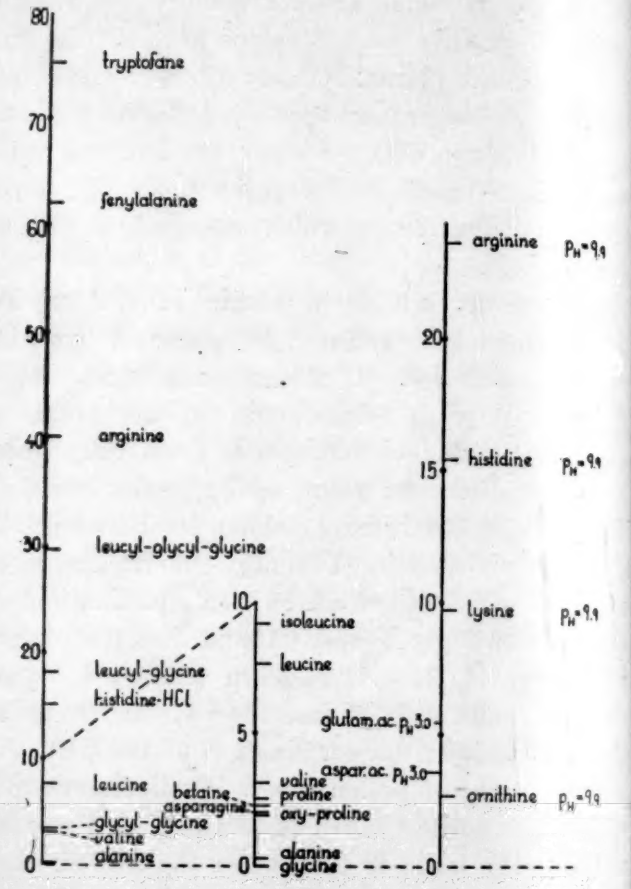


FIG. 3. Specific retardation volumes (cm³ per gram adsorbent) for 0.5 per cent. solutions of some amino acids and peptides.

The method described is obviously a modification of the Tswett chromatographic analysis, but it is not limited to colored substances and is easier to adapt for quantitative work.

ARNE TISELIUS

INSTITUTE OF PHYSICAL CHEMISTRY,
UPSALA, SWEDEN

BOOKS RECEIVED

DRINKER, CECIL K. and JOSEPH M. YOFFEY. *Lymphatics, Lymph and Lymphoid Tissue; their Physiological and Clinical Significance.* Harvard University Monograph in Medicine and Public Health No. 2. Pp. ix + 406. 50 figures. Harvard University Press. $4.00.

LLOYD-JONES, ESTHER and RUTH FEDDER. *Coming of Age.* Pp. x + 280. Whittlesey House, McGraw-Hill. $3.50.

RITCHIE, JOHN W. *Biology and Human Affairs.* Pp. xiv + 1026. Illustrated. World Book Company. $2.32.

WILLIAMS, ROGER J. *An Introduction to Organic Chemistry.* Fourth edition. Pp. xiii + 628. Van Nostrand. $4.00.

by E. O. Kraemer (Interscience Publishers, Inc., New York).